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Bartling, Björn ; Fehr, Ernst ; Schmidt, Klaus M

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# Screening, Competition, and Job Design:<sup>\*</sup>

## Economic Origins of Good Jobs

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**Abstract:** High-performance work systems give workers more discretion, thereby increasing effort productivity but also shirking opportunities. We show experimentally that screening for work attitude and labor market competition are causal determinants of the viability of high-performance work systems, and we identify the complementarities between discretion, rent-sharing, and screening that render them profitable. Two fundamentally distinct job designs emerge endogenously in our experiments: “bad” jobs with low discretion, low wages, and little rent-sharing and “good” jobs with high discretion, high wages, and substantial rent-sharing. Good jobs are profitable only if employees can be screened, and labor market competition fosters their dissemination.

**Keywords:** job design, high-performance work systems, screening, competition, work attitude, reputation, trust, control, complementarities

**JEL:** C91, D86, M50

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# 1 Introduction

*“Trust is good, control is better.”* This famous quote attributed to Lenin refers to a fundamental question in any principal-agent relationship: To what extent should the principal leave discretion to the agent? Standard principal-agent theory suggests that discretion should be limited as much as possible; otherwise the agent will either exploit his freedom to shirk or he will have to be offered expensive monetary incentives to choose actions that are in the principal's interest.<sup>1</sup> Similarly, Taylorism, the dominant paradigm of scientific workplace organization in the first two-thirds of the 20<sup>th</sup> century, is based on the assumption that workers will always work at the slowest rate that goes unpunished. Standardization of the production process is therefore essential, so that that the workers' efforts can be effectively monitored and controlled.

More recent human resource management (HRM) theories, however, stress the cost of control. A worker who has to follow strict and tightly controlled rules cannot use his private information and ingenuity to solve problems “on the floor,” and his productivity decreases because he cannot adapt his actions to changes in his environment. Modern high-performance work systems (HPWS) decentralize the gathering and processing of information and grant authority to workers to act on this information as they see fit in order to solve the problems that arise.<sup>2</sup> This strategy reduces the cost of control and increases productivity, but it makes the company vulnerable. It remains at the worker's discretion whether to use his authority to benefit his company or to shirk.

In this paper, we address the fundamental trade-off between efficiency of effort and control of effort that underlies the different forms of work organization. We show experimentally that offering discretion to an agent is not profitable on its own. However, if offering discretion improves the agent's productivity in addition to being combined with high fixed wages that offer a high share of the surplus to the agent, and if the principal can screen agents based on their past behavior, this combined strategy becomes profitable. Put differently, we show that offering discretion, paying high wages, and screening are complements. Complementarities imply that

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<sup>1</sup> If the agent has fewer actions to choose from, fewer incentive compatibility constraints have to be satisfied. Thus, the implementation of an action becomes cheaper if the agent has less discretion. Furthermore, Grossman and Hart (1983) show that having a more informative signal about the agent's action reduces the implementation cost. Thus, having additional information through more monitoring and control, i.e., less discretion, is always beneficial.

<sup>2</sup> See, e.g., Lawler, Mohrman and Ledford (1995), Appelbaum, Bailey, Berg, and Kalleberg (2000), and Ichniowski and Shaw (2003) for an overview of the different forms that these work systems can take.

different components of a strategy reinforce each other and therefore lead to a bundling or clustering of these components.

In our experiments, we document the endogenous emergence of two distinct clusters of job characteristics based on two fundamentally distinct strategies – a *control strategy* and a *trust strategy*. Under the control strategy, the employers offer jobs characterized by limited effort discretion, a low requested effort, and low wages that grant only a low share of the surplus. Under the trust strategy, the employers offer jobs with high effort discretion, they request a high effort, and they pay high wages that grant a high share of the surplus. In other words, the trust strategy is to offer “good” jobs, while the control strategy is associated with “bad” jobs. While the trust strategy is clearly beneficial for employees, it requires a considerable amount of trust on the part of the employer. He pays a higher wage and – due to the greater effort discretion – he risks increased employee shirking. Thus, if the employee is not trustworthy, the employer incurs a significant loss, which raises the question how the trust strategy can be viable.

Our experimental treatments identify key economic conditions under which the trust strategy is superior to the control strategy. We show, in particular, that opportunities to screen employees based on signals about past performance are decisive for the viability of the trust strategy. In the absence of such screening opportunities – in our base treatment – the large majority of employees shirked and the employers predominantly implemented the control strategy. In contrast, an imperfect signal about employees’ past performance was provided in our screening treatment, and many employers in this treatment conditioned their job offers on this signal. Employees with a signal indicating high past performance obtained good jobs in the majority of cases, while almost all employees with low signals received bad job offers. The employers’ screening behavior generated incentives for the employees to increase effort in order to improve their reputations, which led to a substantial increase in employees’ average effort in the screening treatment compared to the base treatment.

It is important, however, to point out that the reputation formation opportunities in the screening treatment did not induce employees to provide high effort *per se*. Employees with a high performance signal tended to reciprocate reliably high wages with a high level of effort, but they withdrew their effort if they received a low wage offer, even if this hurt their reputation and lowered their expected future payoffs. This behavior forced principals to pay high wages if they

wanted to elicit high effort. However, by offering high wages only to high-reputation employees, employers could limit the risk associated with paying the high wage upfront.

Although the possibility of screening employees leads to an increase in the provision of good jobs and higher effort, it does not suffice for bringing the market to the efficiency frontier because a significant fraction of employers only used the control strategy. These employers never experienced that paying high wages to high reputation employees pays off. There is also a non-negligible minority of employees who *always* shirked even though investing in a good reputation would have been profitable. Similar to employers who never trust, these employees never learned that reciprocating to high wage offers by choosing high effort levels increases future income.

This interaction of heterogeneous employees and employers gives rise to a segmentation of the labor market. In the screening treatment, some employees work hard, acquire a good reputation, and tend to be offered good jobs. Other employees shirk, are left with a poor reputation, and get stuck with bad jobs. Our results show that in an environment where screening and reputation building is possible, employees who only consider their narrow, short-term self-interest are more likely to end up in work environments that are tightly controlled and leave no rents on the table, while employees who behave reciprocally – for intrinsic or strategic reasons – are more likely to get good jobs that leave them more discretion and offer higher rents.

What determines the relative size of these two segments in the labor market? To address this question, we implemented a third treatment that adds labor market competition to the screening treatment. We show that competition among employers for high reputation employees and among employees for good job offers increases the incentives for employees to acquire a high reputation and for employers to condition job offers on past performance, and it fosters learning such that most market participants behave (close to) optimally. Employers realize that they will not be able to hire employees with good track records by offering bad jobs. Employees realize that they will be left behind if they do not have a good reputation. As a result, the fraction of good jobs increases significantly, and both employers and employees benefit from the introduction of competition.

Our paper contributes to the economics, HRM, and industrial relations literatures that analyze the determinants and effectiveness of different forms of workplace organization. The theoretical literature (Milgrom and Roberts 1990, 1995; Kandel and Lazear 1992; Baker,

Gibbons, and Murphy 1994; Holmström and Milgrom 1994) suggests that important complementarities between technology, strategy, and incentive systems exist. Ichniowski, Shaw and Prennushi (1997), the work summarized in Ichniowski and Shaw (2003), and MacLeod and Parent (1999) provide evidence consistent with the view that there are complementarities between job characteristics, different HRM practices, and the form of compensation. In addition, there is convincing evidence (reviewed in Ichniowski and Shaw 2003) that HPWS are frequently more productive than more traditional job designs. To the best of our knowledge, however, the previous empirical literature did not explicitly identify the *causal* factors behind the actual implementation and the viability of HPWS.<sup>3</sup> In fact, one of the enduring puzzles in this literature is why only some firms implement HPWS, despite the prospect of productivity gains, while others do not (see, e.g., Osterman 1994; Ichniowski and Shaw 1995, 2003; Ichniowski et al. 1997; Pfeffer 2007; Liu, Guthrie, Flood and MacCurtain 2009). Our experiments show that, first, opportunities to screen employees for work attitude and second, labor market competition are key *causal* forces behind the prevalence and viability of the trust strategy. In addition, we identify the mechanisms through which these causal forces exert their influence.

Our data allow, in particular, a clean identification of the complementarities between high efficiency wages, effort discretion, and screening, i.e., we can explicitly document that interactions between these variables have large effects on profits. We show, first, that the marginal profit of a wage increase is negative in the absence of screening opportunities but positive in the screening treatment if the employer can restrict the payment of efficiency wages to medium and high reputation employees. Second, we show that the marginal profit of a wage increase for employees with a medium or high reputation is much higher under full discretion than under limited discretion. Third, our data indicate that effort discretion and screening are complements because full discretion has a negative (or zero) impact on profits in the absence of screening opportunities, while full discretion has a large positive impact in the screening treatment if employers limit it to medium and high reputation employees who receive high efficiency wages. Taken together, these complementarities explain why employers bundle the

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<sup>3</sup> Huang and Cappelli (2010), who document interesting correlations between the intensity of firms' screening for employees with a high work morale and other job characteristics, write: "In future research, it would be interesting to examine the causality in these relationships as well as the factors that may cause them to vary, such as whether higher dismissal costs lead to greater screening of all kinds and how screening for different attributes might vary with labor market conditions."

job attributes in two fundamentally distinct job designs, i.e., why they either rely on the control strategy or on the trust strategy. Moreover, the data also indicate that the screening opportunity and competition are complements because competition strengthens both employers' incentives for conditioning job design on employees' reputation and employees' incentives to acquire a good reputation.

The HRM and industrial relations literature often points out that screening is correlated with HPWS (see, e.g., Ichniowski and Shaw 2003). Our findings suggest that screening for a particular employee characteristic, namely, the willingness to provide high effort, is key. A recent paper by Huang and Cappelli (2010) indeed shows that "screening for work attitude" is a strong predictor of important components of HPWS such as low monitoring, high wages, and team work, while screening for skills and work experience is not. Likewise, a paper by Green (2008) shows that British workers whom their company classifies as loyal enjoy higher effort discretion, a result also consistent with the notion that employers screen their employees according to their loyalty (reputation) and offer the loyal employees better jobs.

Our paper is also related to the theoretical and empirical literature on reputation formation (e.g., Fama 1980; Kreps, Milgrom, Roberts and Wilson 1982; MacLeod and Malcomson 1998; Holmström 1999; MacLeod 2007; Brown, Falk and Fehr 2004; Huck, Lünser and Tyran 2006), gift exchange (e.g., Fehr, Kirchsteiger and Riedl 1993; Charness, Fréchet and Kagel 2004) and screening (e.g., Cabrales, Miniaci, Piovesan and Ponti 2010). Our data support, for example, the prediction of Holmström's model (1999) that employees work hard in equilibrium if the market infers their productivity from past performance. Although our set-up differs from his model in various ways, our data corroborate the model's key prediction that reputational incentives enhance effort provision, even in one-shot interactions. However, none of the above papers investigates the role of screening and competition based on past performance signals for an employer's solution to the fundamental trade-off between efficiency of effort and control of effort that underlies different forms of work organization such as Taylorist or HPWS.<sup>4</sup>

Our findings also have a bearing on the sources of segmented labor markets – as described, for example, in Doeringer and Piore (1971) – and suggest a new reason for the coexistence of good and bad jobs. Bulow and Summers (1986) and Saint-Paul (1997) link the

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<sup>4</sup> The study of Cabrales et al. (2010) has a rather different focus. In their set-up, there is a trade-off between fairness and robustness to strategic uncertainty. They find that while strategic uncertainty aversion is a stronger determinant of choices than fairness, agents prefer to work for principals with similar distributional concerns.

existence of dual labor markets to technological factors that determine, for example, monitoring costs. Since “technology” is constant across our treatments, our findings suggest that employers' suboptimal choices and employees' narrowly self-interested behavior also contribute to segmentation. A non-negligible minority of the employees behaved in a narrowly self-interested way in the screening treatment because they did not reciprocate high wages with high effort, even though this damaged their reputations and future incomes. In addition, a substantial minority of employers did not condition job design on employees' track records, although this would have been more profitable. If competition prevails, however, suboptimal behavior is largely removed and labor market segmentation tends to vanish. This finding further indicates that the extent of individual rationality may not just be a personality trait, but may also be affected by the degree of competition in a market.

Finally, our paper is related to the literature on the impact of control and extrinsic incentives on intrinsic motivation and voluntary cooperation (e.g., Frey 1997; Fehr and Rockenbach 2003; Falk and Kosfeld 2006; Ellingsen and Johannesson 2008). In particular, Falk and Kosfeld show experimentally that some agents reduce voluntary effort provision if the principal chooses to control them. These “hidden costs of control” may, therefore, diminish the principals' incentive to limit the agents' discretion, i.e., to control them, even in the absence of screening opportunities. Although our data are consistent with the existence of hidden costs of control, they also suggest that these costs are not sufficiently high (in our setting) to induce the employers to forgo their control option. In the absence of screening opportunities, the vast majority of the employers converge towards the control strategy because it is more profitable.

The remainder of the paper is organized as follows. Section 2 outlines the experimental design and procedural details. In Section 3, we discuss the behavioral implications for our set-up if (i) all subjects are self-interested, (ii) a share of the subjects also has a preference for fairness and (iii) hidden costs of control exist. Section 4 presents and discusses the experimental results on the clustering of job attributes, the employers' optimal and actual strategies, the existence of suboptimal employers and employees in the screening treatment, and the resulting segmentation of the labor market. In this section we also analyze the effects of labor market competition. Section 5 discusses the empirical relevance of our experiment and its relation to other explanations of HPWS. Section 6 concludes. A supplementary online appendix contains additional analyses and the experimental instructions.



## 2 Experimental Design and Procedures

Consider an employer who hires an employee for production. The employee generates a monetary gross profit  $b \cdot e$  if he expends effort  $e$ . The parameter  $b > 1$  reflects the employee's efficiency. Gross profits,  $b \cdot e$ , accrue directly to the employer. The employee incurs private effort costs  $c(e)$  measured in monetary terms, with  $c(e) = e$ , but receives a wage  $w$  from the employer. Payoffs are thus given by  $\Pi = b \cdot e - w$  for the employer and by  $U = w - e$  for the employee. There is a conflict of interest as the employer prefers high effort and low wages while the employee prefers low effort and high wages.

The employer can offer an employment contract to the employee that specifies a fixed wage  $w$  and a requested, non-binding, effort level  $\tilde{e}$ .<sup>5</sup> The wage must at least cover the costs of the requested effort and cannot exceed  $\bar{w} = 50$ . The contract can neither condition on effort, or effort costs, nor on gross profits. If the employee rejects the contract offer, no wage is paid, no effort is exerted, and both parties receive their reservation utilities of 0. If the employee accepts, the employer must pay the offered wage, irrespective of the actual effort the employee chooses.

There are two types of contracts that the employer can offer: a *contract with full discretion* and a *contract with limited discretion*. These contract types differ in two dimensions:

1. *Feasible effort levels*: In a contract with full discretion, the employee can choose any effort level between  $e \in \{1, 2, \dots, 10\}$ , whereas he must choose an effort level of at least 3 in a contract with limited discretion, i.e.,  $e \in \{3, 4, \dots, 10\}$ , given he accepts the contract.
2. *Efficiency*: The effort efficiency of the relationship is characterized by  $b = 5$  in a contract with full discretion, while the efficiency parameter is only  $b = 4$  in a contract with limited discretion.

This experimental design captures the fundamental trade-off between efficiency and control described in the HRM literature.<sup>6</sup> Limiting discretion forces employees to obey some

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<sup>5</sup> The purpose of the requested effort level is to coordinate expectations. The principal can communicate what he considers to be an adequate effort choice for the offered wage. From a game theoretic perspective the requested effort level is just cheap talk. However, the literature on HRM and HPWS emphasizes the importance of extensive labor-management communications (see, e.g., Ichniowski and Shaw 2003, p. 164). One of the HRM practices that are considered in Ichniowski et al. (1997) explicitly measures whether efforts were made “to set clear expectations about required work behaviors of the new workers” (p. 294).

<sup>6</sup> The efficiency gains from higher task discretion and lower control are vividly described in Walton (1985, p. 77) who writes that “workers respond best – and most creatively – not when they are tightly controlled by management,

minimum standards, which is reflected in the higher minimum effort level. But limiting discretion also restricts employees' ability to work more smartly, that is, to react in a flexible and efficient way to a changing environment. For example, the employer can establish strict production procedures to tightly govern the employee's actions, regulate working hours by using time cards to monitor attendance, or impose reporting obligations to better assess performance. However, regulated working hours force the employee to work when he might not be most productive, reporting obligations absorb the employee's time and attention, and strict production procedures forfeit other, possibly more efficient practices. The harder the employee works, the more costly restricting his actions becomes. This is reflected by the reduction of the efficiency parameter  $b$ . All employers and employees know the payoff functions, the set of feasible contracts, and hence the efficiency implications of limited discretion.

We start out with two treatments, the *base treatment* and the *screening treatment*. Each treatment involves 15 periods. In each period, an employer is randomly matched with one of the employees to preclude repeated game effects. In the base treatment, the employer does not receive any information about his current employee, while he receives an imperfect signal about his current employee's track record in the screening treatment: he is informed about his current employee's effort choices in the last three periods.<sup>7</sup> Note that an employer neither observes the contract types, the wage offers, nor the requested effort levels that his current employee faced in the last three periods. The employers are thus not perfectly informed about their employees; a low effort choice, for example, can indicate an untrustworthy employee who was offered a high wage or a reciprocal employee who was offered a low wage. Employees know that future

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placed in narrowly defined jobs, and treated like an unwelcome necessity, but, instead, when they are given broader responsibilities, encouraged to contribute, and helped to take satisfaction in their work." In broadly defined jobs, employees can play "a significant role in solving problems and improving methods" which is thought to "boost in-plant quality, lower warranty cost, cut waste, raise machine utilization and total capacity with the same plant and equipment, reduce operating and support personnel, reduce turnover and absenteeism, and speed up implementation of change" (Walton 1985, p. 81). Note that many of the factors mentioned by Walton involve a higher productivity of effort, i.e., a given effort level generates higher value for the firm if effort can be exerted in broadly defined jobs and if employees are free to decide how they perform their tasks. The more recent literature on HPWS (e.g., Ichniowski et al. 1997, Appelbaum et al. 2000, Osterman 2006) confirms that not only technology and skill but also the organization of the workplace (e.g., information sharing, allocation of substantial decision rights, careful recruiting, and training) affects productivity. On the downside, HPWS impede the effective control of employees; in the words of Osterman: "employees gain the capacity to, in a sense, hold the firm hostage" (2006, p. 190).

<sup>7</sup> If the employee did not choose an effort level in one of the past three periods because he rejected a contract, the principal received this information. In periods 1-3, a principal could only be informed about the effort levels that were available so far.

employers will be able to observe their current effort choices. Apart from the information given to the employers in the screening treatment, the two treatments are identical.

The screening treatment reflects the fact that employers sometimes have the opportunity to receive information about an employee's past performance before the time of hiring. For example, the employer may see letters of reference, he may have talked to a previous employer about the employee, or he may have observed the employee directly in his previous position. This information, however, is typically incomplete. Even if the employer receives an accurate signal about the employee's previous performance, he does not observe which contract induced the observed behavior and how well the employee was treated. This is reflected in our experimental design where the employer observes the employee's actions but not the contracts he was offered. Note that the baseline treatment and the screening treatment can be considered as treatments with two extreme versions of screening costs. Screening costs are infinite in the baseline treatment, rendering any screening unprofitable, while the screening costs are zero in the screening treatment because the employers do not have to pay for the information about past performance.

We conducted three sessions of the base treatment and three sessions of the screening treatment with 36 participants in each session. We implemented two matching groups in each session, so we have six matching groups for each treatment.<sup>8</sup> Upon arrival at the lab, half of the subjects were randomly and anonymously assigned the role of an employer, the other half the role of an employee. The experiment was framed as an employment relationship. We used no value laden terms like full or limited discretion, control, trust, or efficiency. We also conducted two sessions of a *competition treatment*, where we implemented, in addition to the screening opportunity, competition between employers for employees with a good reputation and between employees for employers with attractive job offers. In each session we had 32 participants who were divided into two matching groups. The competition treatment is described in more detail in Section 4. All experimental instructions are in Section A6 of the supplementary appendix.

Sessions lasted about 2 hours in the base and screening treatment and 3 hours in the competition treatment and took place at the Institute for Empirical Research in Economics at the

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<sup>8</sup> With 15 periods and matching groups of 9 employers and 9 employees some of the subjects interacted with the same opponent more than once. However, subjects did not know that they were divided in two matching groups, nor did they know whether and if so with whom they would interact more than once. Thus, repeated games effects are very unlikely.

University of Zurich. Subjects were students from the University of Zurich and the Swiss Federal Institute of Technology in Zurich. All experiments were computerized with the software z-Tree (Fischbacher 2007). Payoffs were measured in experimental points that were exchanged into Swiss Francs at the end of the experiment. On average, subjects earned about CHF 43 (USD 35 at the time of the experiments).

### 3 Behavioral Predictions

A central question the experiments address is whether there are complementarities between different attributes of a job such as the wage level, requested effort, effort discretion, and job rents, whether this leads to distinct bundles of job attributes, and if so, which attributes are bundled together. In addition, we want to isolate the causal forces that render one or the other bundle profit-maximizing and compare them with the bundles the employers actually chose. Different behavioral approaches suggest different answers to these questions.

#### 3.1 Self-interest model

The standard neoclassical approach assumes that all people are fully rational and only interested in maximizing their own material payoffs. In this case, the (second best) optimal contract is straightforward. In the base treatment, the employee always chooses the effort level that minimizes his cost, which is  $e = 1$  in a contract with full discretion and  $e = 3$  in a contract with limited discretion. Furthermore, he accepts all contract offers that yield a non-negative payoff. Therefore, the employer offers a wage that holds the employee down to his reservation payoff of 0. The contract that maximizes the employer's profit is thus a contract with limited discretion and a wage of  $w = 3$ . This yields profit  $\Pi = 4 \cdot 3 - 3 = 9$ . Offering a contract with full discretion and a wage of  $w = 1$  only yields a profit of  $\Pi = 5 \cdot 1 - 1 = 4$ . This prediction holds for both the base and the screening treatments. In the last period of the screening treatment, employees have no reputation to lose and will thus choose the minimum effort level. Employers anticipate this and offer a contract with limited discretion and a wage of 3. By backward induction, this outcome is also the unique prediction for all previous periods.<sup>9</sup>

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<sup>9</sup> This equilibrium outcome is unique if wages and effort levels are continuous variables. We are grateful to a referee for pointing out that a second equilibrium exists in the one-shot game if wages and effort levels are discrete: Employers offer contracts with limited discretion and a wage of 4. All employees accept and choose the minimum effort level of 3. Wages smaller than 4 are rejected. Even though the two equilibria of the one-shot game are very

The self-interest model thus implies that the control strategy prevails in both the base and the screening treatment. Employers will always offer a low wage job with limited discretion that just covers the effort cost of the requested low effort level, and employees always choose the minimal effort level of  $e = 3$ .

### 3.2 Social preferences

Models of social preferences (e.g., Rabin 1993; Fehr and Schmidt 1999; Dufwenberg and Kirchsteiger 2004; Falk and Fischbacher 2006) predict that some employees are “fair” and reciprocate high wages with high effort levels, while other employees are mainly self-interested (for a survey see, e.g., Sobel 2005 or Fehr and Schmidt 2006). These models also predict that controlling an employee does not reduce his effort as long as he is offered a fair wage.<sup>10</sup> If the employer cannot observe the employee’s past record, her optimal contract offer depends on the share of “fair” employees in the population. For example, the Fehr and Schmidt (1999) model predicts that if there are fair employees (who reciprocate high wages with an effort level that equalizes payoffs) and “selfish” employees (who always choose the minimal effort level) then contracts with limited discretion and low wages are optimal in the base treatment if the fraction of fair employees is smaller than 60 percent.<sup>11</sup> The model also predicts that contracts with limited discretion and wages greater or equal than 7 will be accepted with probability one because they give at least half of the surplus to the employee. If less than 44 percent of the employees are fair (and reject wages below 7), selfish employers will offer a wage of 3 while fair employers will offer a wage of 7.

How does the possibility of building a reputation affect this prediction? With reputation, there exists an efficient equilibrium along the lines of Kreps et al. (1982). In this equilibrium, all

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similar and differ only in that the wage is either 3 or 4, they can be used to construct multiple equilibria in the screening treatment. For example, the employee can be induced to choose an effort of 4 in the second to last period by offering a contract with limited discretion and a wage of 4. On the equilibrium path the employee chooses  $e=4$  and is rewarded by the continuation equilibrium where the next employer offers a wage of 4 in the last period. If the employee deviates and chooses  $e=3$ , the continuation equilibrium changes and the next employer will now offer him  $w=3$ . However, these equilibria require that employers can perfectly coordinate their behaviors.

<sup>10</sup> The reason is that fairness (or kindness) is evaluated only by payoff consequences in all these models. Also in models of intention based reciprocity such as Rabin (1993) the fairness of certain actions is evaluated by the payoff actually given to the other player relative to the set of feasible payoffs that could have been given to the other player. Thus, if the wage is fair, controlling the employee has no impact on the perceived fairness of the situation.

<sup>11</sup> In Section A1 of the supplementary appendix we show that in the base treatment about 70 percent of our subjects can be classified as selfish and 30 percent as fair. This is well below the required threshold of 60 percent. In Section A2 we derive the optimal contract and the predicted behavior of employers and employees as a function of the fraction of fair subjects in a simple model with inequity aversion.

employers offer employees with a high reputation generous contracts with full discretion in all but the last few periods, and contracts with limited discretion and low wages to those with a low reputation. Fair employees with a high reputation (or, in period 1, with no reputation yet) accept generous contracts with full discretion and work hard in all periods. They reject contracts with limited discretion and those with full discretion combined with low wages. Selfish employees mimic fair employees in all but the last few periods where they start to randomize between spending a high effort of 10 and a low effort of 1. Once they have lost their good reputations, selfish employees shirk forever.<sup>12</sup>

To summarize, the model of inequity aversion predicts that employers in the base treatment predominantly implement the control strategy, i.e., that they offer contracts with limited discretion and low wages, which induces employees to choose an effort level close to  $e = 3$ . In the screening treatment, employers will condition their job offers on the available signals about past performance. They use the trust strategy for employees with a high signal, i.e., offering contracts with full discretion and high wages, while they use the control strategy for employees with a low signal, i.e., providing contracts with limited discretion and low wages. The resulting incentive for reputation formation will induce employees to choose higher effort levels than in the base treatment. The joint effect of high performance signals and the conditioning of good job offers on high performance signals are predicted to lead to a prevalence of the trust strategy in the screening treatment.

### 3.3 Hidden costs of control

Fehr and Rockenbach (2003) and Falk and Kosfeld (2006) show experimentally that controlling agents may crowd out voluntary effort provision. Falk and Kosfeld (2006) called this the “hidden costs of control,” and Ellingsen and Johannesson (2008) provide a formal model that rationalizes this behavioral pattern. In our set-up, hidden costs of control would arise if fair employees, who are willing to provide effort above the minimally enforceable level if they are offered high wages and full discretion, reduce their voluntary effort provision if they are controlled. However, there

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<sup>12</sup> This equilibrium is, of course, only one of many possible equilibria in the screening treatment. The multiplicity of equilibria is a typical feature of games in which reputation matters; it renders unique predictions impossible. However, this is the most efficient equilibrium, and the beliefs and behaviors associated with it seem plausible; they are based on the intuition that employers benefit from the screening opportunity by conditioning their job offers on the available performance signal, which then generates reputational incentives for the employees to provide high effort levels in response to generous job offers. Therefore, we use this equilibrium as a heuristic tool for the generation of behavioral conjectures.

are two additional effects of a limited discretion contract that point in the opposite direction. First, limiting discretion reduces the shirking of selfish employees who are forced to work harder. Second, limiting discretion reduces the efficiency parameter from  $b=5$  to  $b=4$ , which may increase effort if some employees are inequity averse. The Fehr-Schmidt (1999) model predicts that for any given wage an inequality averse employee will react to limited discretion with a weakly higher effort level to compensate for the lower efficiency of effort.<sup>13</sup> These two latter effects may outweigh the hidden cost of control effect. However, if – conditional on wages – the average effort under limited discretion contracts is strictly smaller than under full discretion contracts, then we can unambiguously conclude that hidden costs of control exist. Furthermore, if these costs are sufficiently high, they may render full discretion contracts more profitable than limited discretion contracts even in the base treatment where the employers have no information about their employees.

## 4 Results

In Section 4.1, we discuss the employers' job strategies, i.e., their clustering of job attributes. Section 4.2 analyzes the optimality of these clusters in the different treatments. In Section 4.3, we explain the pattern of profit-maximizing clusters of job attributes in terms of employees' effort behavior and discuss whether hidden costs of control affect this pattern. Section 4.4 examines whether employers offer the optimal clusters of job characteristics in the different treatments and how the deviations from optimality are associated with labor market segmentation. In Section 4.5, we study the impact of labor market competition on the employers' job strategies, the employees' effort choices, market segmentation, and overall surplus.

### 4.1 Dichotomy of Job Design

Our experimental design allows for a large number of combinations between full and limited discretion, wages, requested effort levels, and offered shares of the surplus. However, we observe predominantly two very distinct clusters of job characteristics:

**Result 1 (dichotomy of job design):** *The employers rely predominantly on two fundamentally distinct strategies in both the base and the screening treatment, i.e.,*

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<sup>13</sup> An inequality averse employee chooses  $e$  to equalize payoffs, i.e.,  $w - c(e) = be - w$  which implies  $e(w) = 2w/(b+1)$ .

they offer two types of jobs that differ in all dimensions. They offer either a job with full discretion, high wages, a high requested effort level, and a high share of the surplus for the employee (trust strategy), or they offer a job with limited discretion, low wages, a low requested effort level, and a low share (control strategy).

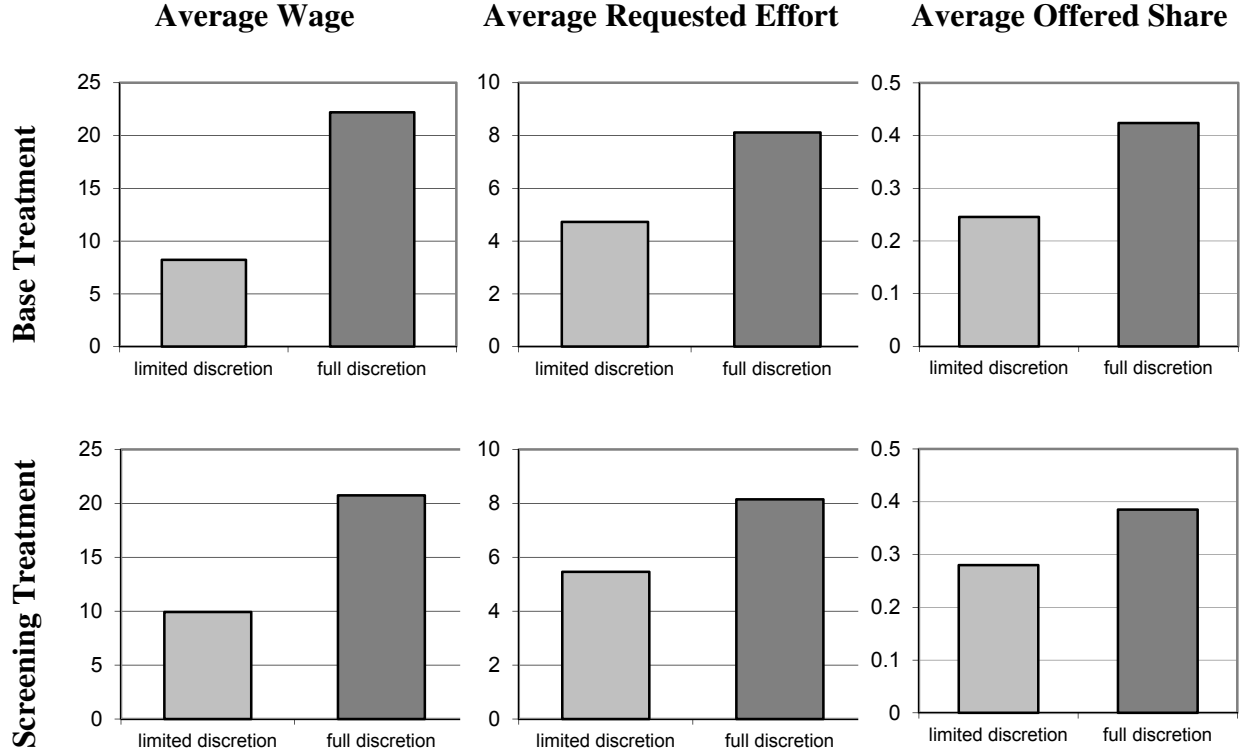


FIGURE 1.—**Dichotomy of Job Design.**

Support for Result 1 is provided by Figure 1, which shows average wages, average requested effort levels, and the average offered share of the surplus for both treatments. The offered share of the surplus is defined as  $\min\{[w - c(\tilde{e})]/[b\tilde{e} - c(\tilde{e})], 1\}$ , i.e., it is determined by the wage  $w$  and the requested effort level  $\tilde{e}$ . The figure shows the same clustering of job characteristics for both treatments. For example, if the employer offers a job with full discretion, average wages are higher than 20 in both treatments, while average wages are below 10 for job offers with limited discretion. Likewise, the average requested effort level is roughly  $\tilde{e} = 8$  in case of a job with full discretion, while the employer only asks for approximately  $\tilde{e} = 5$  under limited discretion. Finally, the employees are offered about 40 percent of the surplus in jobs with full discretion but below 30 percent in jobs with limited discretion. All these differences in job characteristics



across full and limited discretion jobs are highly significant (two-sided t-tests,<sup>14</sup> controlling for individual fixed effects and clustering on employers,  $p \leq 0.001$  for each of the six tests implicit in Figure 1).<sup>15</sup> Result 1 suggests that job offers with full discretion are based on a *trust strategy* that attempts to appeal to the employees' fairness by offering a generous share of the surplus, while jobs offering limited discretion implement a *control strategy* that limits the employee's shirking opportunities and the losses the employer can incur.

## 4.2 Profitability of Different Clusters of Job Attributes

Result 1 raises the question which strategy is more profitable. The next result provides this information.

**Result 2 (optimality of different clusters):** *The control strategy is optimal for the employer in the base treatment even though limiting discretion reduces efficiency. In the screening treatment it is optimal to condition on the employee's track record. If the employee has a medium or high reputation the trust strategy is optimal, while the control strategy is better if the employee has a low reputation.*

An employee is assigned to the low reputation category if his average effort in the previous three periods, denoted by  $r$ , is below 3.5; he has a medium reputation if  $3.5 \leq r < 6.5$ , and a high reputation if  $r \geq 6.5$ .<sup>16</sup> The upper panel of Figure 2 provides support for Result 2. In the base treatment, employers who offer contracts with limited discretion and low wages ( $w < 10$ ) earn significantly more than employers offering jobs with full discretion and low wages (t-test,  $p \leq 0.001$ ) and employers offering contracts with limited discretion and medium wages ( $10 \leq w < 20$ ; t-test,  $p \leq 0.001$ ). In fact, employers who offer full discretion contracts incur losses on average. In the screening treatment the profit pattern in case of low reputation employees is remarkably similar to the base treatment. Again, offering a contract with limited discretion and low wages is significantly better than full discretion and low wages or limited discretion and medium wages (t-tests,  $p \leq 0.001$ ). Thus, in the base treatment and in the screening treatment with

<sup>14</sup> All tests reported in this paper are two-sided.

<sup>15</sup> The observed differences in job characteristics are not only perceived at the level of averages. See Section A3 of the supplementary appendix for more detailed information. In Section A4 of the supplementary appendix we also show that the clustering is stable over time.

<sup>16</sup> In the first period, an employee has no reputation and the reputation index is not defined. In the second and third period, the reputation index  $r$  uses the information of only one and two periods, respectively. If a contract was rejected in a period, this period was not considered for the computation of  $r$ .

low reputation employees, employers' profits are highest when they offer contracts with limited discretion and pay low wages. This contrasts sharply with the screening treatment with medium and high reputation employees where profits are highest when contracts with full discretion and high wages ( $w \geq 20$ ) are offered. If employers pay high wages, their profits are significantly higher if they offer a job with full rather than a job with limited discretion; and given a full discretion job offer, paying high wages is more profitable than paying medium wages (t-tests,  $p \leq 0.001$ ). Note that in all cases either the trust or the control strategy maximizes profits; there is no situation in which some other possible job design (e.g., full discretion combined with low wage offers) is optimal. Tables 1 and 2 below provide regression analyses of employers' profits in the base and the screening treatment confirming the results on optimal contract choices.

### 4.3 Employees' Effort Choices

Result 2 raises the question why the control strategy is optimal in the base treatment and in the screening treatment with low reputation employees, while the trust strategy is optimal in the screening treatment when employees have a medium or high reputation. Since the profit pattern is shaped by the employees' effort choices, we examine the employees' behavior next.

**Result 3a (employees' effort responses in the base treatment):** *The employees respond to higher wages with higher average effort levels in the base treatment, but the slope of the wage-effort relation is too small to render a high wage strategy profitable. In addition, employees provide considerably higher effort at low wages when they are offered a job with limited discretion than when they have full discretion. This renders the control strategy optimal.*

Support for Result 3a is provided by the corresponding graphs in Figure 2 and the regressions in Table 1. The left bottom graph of Figure 2 shows that in the base treatment higher wages are reciprocated with higher average effort levels both for jobs with limited and jobs with full discretion. However, the effect is too small to render a high wage strategy optimal, which can be seen in the corresponding profit graph. Moreover, at low wages, effort is much higher in jobs with limited than in jobs with full discretion, which renders – despite the efficiency loss of limiting discretion – the control strategy optimal.

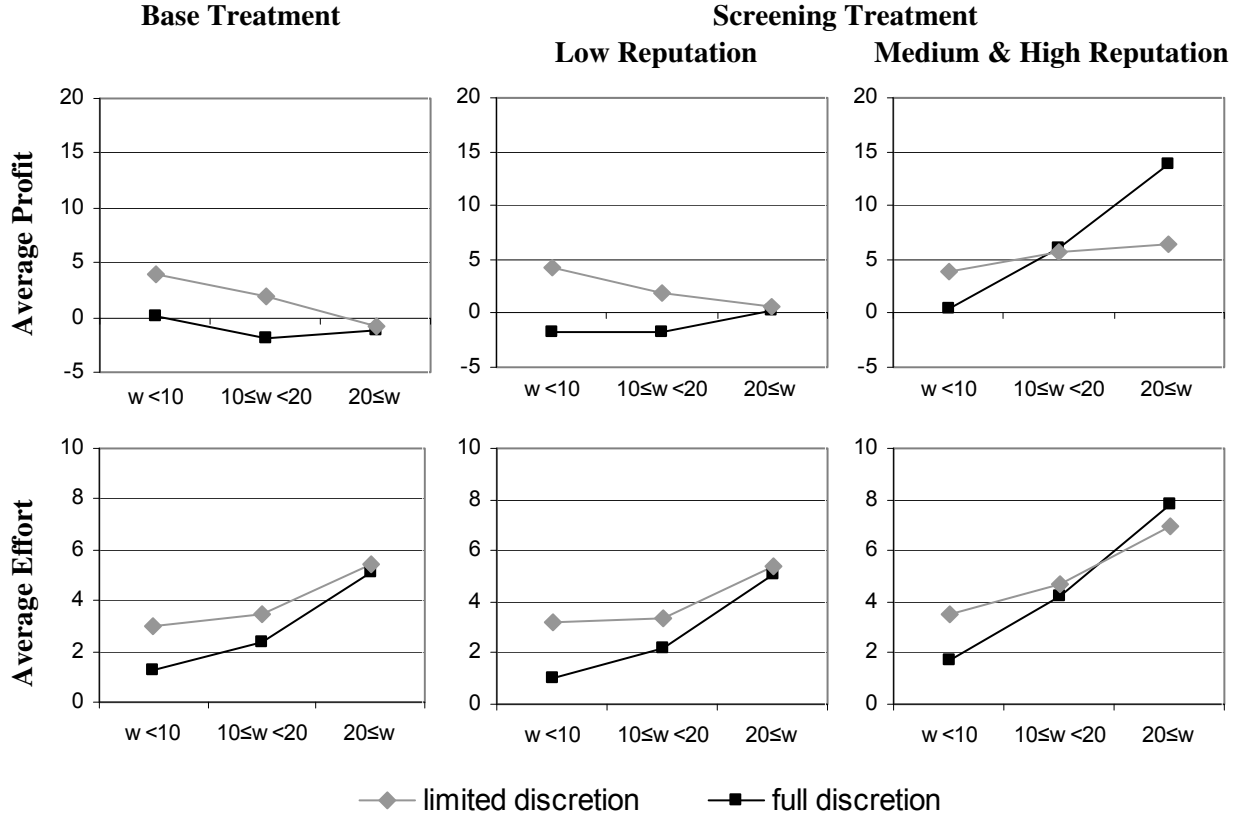


FIGURE 2.—Optimal Job Offers and Wage-Effort Relation.<sup>17</sup>

The regressions in Table 1 confirm these findings. In effort regression (1), the wage coefficient for a full discretion job, which is the omitted category in the regression, is about 0.2. As the productivity of effort is  $b=5$ , this coefficient implies that a wage increase of 10 raises effort by roughly 2, which in turn increase revenue by  $5 \times 2 = 10$ , implying a flat wage-profit relation for jobs with full discretion. This is confirmed by the profit regression (3), where the wage coefficient is close to zero and insignificant. Since the interaction between the dummy for limited discretion (“limited”) and wage is significantly negative in the effort regression, the wage coefficient for jobs with limited discretion is lower and amounts to about 0.14. A wage increase of 10 thus only increases effort by 1.4, which – in combination with the lower effort productivity of  $b=4$  – increases revenue only by  $4 \times 1.4 = 5.6$ , implying that the wage-profit relation is negative. This is also confirmed by the profit regression (3), where the corresponding coefficient is negative and significant. Moreover, the “limited” dummy is significantly positive in the effort

<sup>17</sup> The average effort is computed for accepted contracts only, the average profit for all contracts. Rejection rates are reported in footnote 18 below.

regression, indicating that at low wage levels effort is higher in jobs with limited than in jobs with full discretion. This effort advantage at low wage levels reflects the fact that employees must at least provide an effort of 3 under limited discretion. The large and highly significant coefficient of “limited” in the profit regression (3) indicates that the higher effort levels outweigh the lower efficiency of these jobs. The reason is that reducing the efficiency of effort is relatively inexpensive if employees choose low effort levels. The effort regression (2) finally shows that controlling for requested effort and for period effects does not affect the results.<sup>18</sup>

Table 1—Determinants of Effort and Employers’ Profits in Base Treatment

	(1) effort	(2) effort	(3) profit
wage	0.207*** (0.030)	0.202*** (0.033)	0.007 (0.105)
limited	2.731*** (0.432)	2.722*** (0.446)	6.535*** (1.766)
limited × wage	-0.072** (0.032)	-0.071** (0.032)	-0.263** (0.127)
requested effort	—	0.022 (0.056)	—
period dummies	—	yes	—
constant	-0.517 (0.482)	-0.879 (0.547)	-1.307 (1.691)
observations	658	658	810
adj. R <sup>2</sup>	0.474	0.470	0.063

*Notes:* The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. The effort regressions cluster by employees, control for individual fixed effects, and consider only accepted contracts as no effort is chosen if a contract is rejected. All contracts are included in regression (3) to capture the effect of rejections on profits. In regression (2), only the period dummies 3 and 7 are significant at the 10 and 5 percent level, respectively, i.e., there is no time trend or end game effect. The profit regression (3) is robust to the inclusion of the full set of set of period dummies, too (not shown here).

\*\*\* denotes significance at 1 percent, \*\* at 5 percent, and \* at 10 percent.

<sup>18</sup> Figure 2 and Table 1 raise the question whether employers’ expected profits with limited discretion contracts are maximized by offering the lowest possible wage or whether they should leave some rent to employees. A closer look at the low wage interval ( $w < 10$ ) reveals that holding employees down to their reservation utilities is not optimal because such offers are rejected with a very high probability. In particular, wages of 3, 4, 5 and 6 are rejected in 88, 84, 39 and 30 percent of the cases, respectively, while offers of 7 are only rejected in 13 percent of the cases. Job offers with higher wages are almost never rejected. Offering wages below 7 is thus not optimal.

Taken together, the data indicate that in the base treatment, a high wage strategy is not profitable. In addition, the effect that employees are forced to provide more effort under limited discretion outweighs the productivity disadvantage of limited discretion, thus rendering a control strategy optimal. The next result shows how the employees' effort choices in the screening treatment change this pattern.

**Result 3b (employees' effort responses in the screening treatment):**

- (i) *In the screening treatment, the effort responses of the employees with a low reputation are very similar to their responses in the base treatment, which renders the control strategy optimal.*
- (ii) *The wage-effort relation for employees with a medium or high reputation is steep enough to render the payment of high wages profitable. Moreover, the higher efficiency of full discretion is particularly advantageous at high effort levels, rendering the trust strategy optimal.*

This result is supported by the corresponding graphs in Figure 2 and the regressions in Table 2. A first salient characteristic of the effort pattern of low reputation employees is that it very closely resembles that in the base treatment (compare the left and the middle bottom graph of Figure 2). Low reputation employees in the screening treatment act as if there were no reputational incentives. Thus, as in the base treatment, the control strategy is optimal, which can be seen in the corresponding profit graph. The right bottom graph of Figure 2 shows that employees with a medium or high reputation display a much steeper wage-effort relation than those with a low reputation. The corresponding profit graph reveals that the steeper wage-effort relation translates into a positive wage-profit relation, especially under more efficient full discretion jobs. This renders the trust strategy optimal.

The regressions in Table 2 confirm these findings. While the effort regressions (1) and (2) display a relatively large coefficient for “wage”, regressions (3) – (5) show that the size of the wage coefficient decreases considerably if we control for the employees' reputations and the interaction between reputation, wage, and limited discretion.<sup>19</sup> Note that the omitted category in

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<sup>19</sup> “Medium-reputation” and “high-reputation” are dummy variables that take on value 1 if  $r$  is in  $[3.5, 6.5)$  or  $[6.5, 10]$ , respectively. These dummies are functions of past effort choices; hence the strict exogeneity assumption that ensures the consistency of fixed effects estimators is violated. However, the bias in fixed effects models with a

regressions (3) – (6) is a job with full discretion offered to a low reputation employee, meaning that the wage coefficient in these regressions captures the wage-effort relation for exactly these employees. The wage coefficient in the effort regressions is about 0.2 in these cases, which is very similar to the base treatment, implying a flat wage-profit relation. This is confirmed in the profit regression (6). Moreover, the regressions reveal that the interactions between limited discretion and wages are significantly negative, while the “limited” dummy has a large and highly significant coefficient. Thus, as in the base treatment, the employers can earn the highest profits if they use the control strategy whenever they face an employee with a low reputation.<sup>20</sup>

Turning to medium and high reputation employees, regression (2) shows that these employees do not provide a higher effort level per se; the coefficient on medium and high reputation is small and insignificant in this regression. Rather, these employees tend to supply the same low effort level as low reputation employees if offered a low wage, but they provide much higher effort levels if offered a high wage. This fact is revealed by regression (3), which shows that the medium and high reputation employees display a smaller intercept (the coefficient on medium and high reputation is significantly negative) and a larger slope in the wage-effort space than the low reputation employees (the interaction between wage and reputation is significantly positive). The slope effect, in particular, is large and quantitatively important because it generates an incentive for the employers to pay high wages to these employees, especially if discretion is not limited. The profit regression (6) corroborates these findings and indicates that the effort behavior of medium and high reputation employees causes a sizeable efficiency wage effect that renders – in combination with the higher efficiency of granting full discretion – the trust strategy optimal. The regressions also reveal that there is a large and highly significant last period effect. In the final period there is no longer a reputational incentive which lowers effort and thus profits. Finally, regressions (4) and (5) show that including interactions between reputation and limited discretion, controlling for requested effort, and including dummies for all non-final periods does not affect the results.

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lagged dependent variable is of order  $1/T$  (see Hsiao, 2003, section 8.1). In our experiments we have  $T=15$ , so the bias should be rather small.

<sup>20</sup> Similar to the base treatment, one may ask which wage in the low wage interval maximizes the employers’ profits under limited discretion. Rejection rates for wages offers of 3, 4, 5, 6 and 7 are 100, 59, 46, 39 and 4 percent, respectively, while wages above 7 are almost never rejected. Offering wages below 7 is thus again not optimal.

Table 2—Determinants of Effort and Employers' Profits in Screening Treatment

	(1) effort	(2) effort	(3) effort	(4) effort	(5) effort	(6) profit
wage	0.273*** (0.021)	0.295*** (0.022)	0.187*** (0.049)	0.201*** (0.048)	0.200*** (0.050)	0.065 (0.185)
limited	2.894*** (0.562)	3.230*** (0.522)	2.478*** (0.571)	2.783*** (0.570)	2.693*** (0.545)	6.868*** (1.772)
limited × wage	-0.147*** (0.037)	-0.157*** (0.033)	-0.105*** (0.038)	-0.107** (0.040)	-0.103** (0.041)	-0.478*** (0.118)
medium reputation	—	-0.233 (0.216)	-1.560*** (0.537)	-0.949 (0.655)	-0.936 (0.657)	-1.048 (1.800)
high reputation	—	-0.272 (0.323)	-2.493*** (0.737)	-2.191*** (0.780)	-2.241*** (0.815)	-4.725** (1.928)
medium reputation × wage	—	—	0.102** (0.043)	0.080* (0.045)	0.078* (0.046)	0.424** (0.177)
high reputation × wage	—	—	0.143*** (0.050)	0.132*** (0.048)	0.134*** (0.049)	0.722*** (0.177)
medium reputation × limited	—	—	—	-0.495 (0.420)	-0.467 (0.430)	—
high reputation × limited	—	—	—	-0.232 (0.516)	-0.164 (0.518)	—
requested effort	—	—	—	—	-0.005 (0.058)	—
non-final period dummies	—	—	—	—	yes	—
final period dummy	-1.959*** (0.404)	-2.025*** (0.414)	-1.933*** (0.419)	-1.932*** (0.420)	-1.822*** (0.510)	-7.038*** (1.839)
constant	0.233 (0.410)	-0.032 (0.490)	1.442** (0.719)	1.068 (0.678)	1.028 (0.737)	0.110 (2.231)
observations	711	655	655	655	655	745
adj. R <sup>2</sup>	0.649	0.661	0.676	0.675	0.671	0.301

*Notes:* The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. Effort regressions cluster by employees, control for individual fixed effects, and consider only accepted contracts as no effort is chosen if a contract is rejected. All contracts are included in the regression (6) to capture the effect of rejections on profits. Regressions (2)–(6) consider observations with at least one previous effort choice only as an employee's reputation cannot be classified otherwise. All non-final period dummies in regression (5) are insignificant. The profit regression (6) is robust to the inclusion of the full set of period dummies, too (not shown here).

\*\*\* denotes significance at 1 percent, \*\* at 5 percent, and \* at 10 percent.

Taken together, the evidence unambiguously shows that conditioning the job offer on the employees' reputation is profit maximizing. Employers can elicit high effort in highly productive jobs with a limited risk of shirking if they offer high wages and full discretion only to employees with a medium or high reputation. In contrast, employees with a low reputation should receive only a low wage and be forced to provide at least an effort level of 3.

In Section 3 we discussed the predictions of the self-interest model and models of social preferences. The prevalence of bad jobs in the base treatment is consistent with both the self-interest model and models of social preferences but pure self-interest alone cannot explain the results of the screening treatment. However, if there are some fair employees who are willing to reciprocate high wages with high effort, then selfish employees have an incentive to mimic this behavior and to build up a reputation for being fair in order to get better job offers in the future. It is this reputation building of strategic employees that renders the trust strategy profitable.

We also discussed the potential role of hidden costs of control in Section 3. If – conditional on wages – average effort is strictly lower under limited discretion than under full discretion, then there is unambiguous evidence for hidden costs of control. Figure 2 shows, however, that effort under limited discretion is not lower than effort under full discretion – except for medium and high reputation employees in the screening treatment who receive high wages. This effort difference is, however, explained by the higher average wage under contracts with full discretion within this wage interval.<sup>21</sup> Thus, our results do not unambiguously confirm the existence of hidden costs of control, but they do not rule out their existence either. It is possible that some subjects reduce effort under limited discretion while other agents increase effort, either because they are forced to do so by the higher minimum effort level or because they are inequity averse and spend more effort to compensate for the lower effort productivity. These effects could cancel each other out.<sup>22</sup> However, the data do show that in our setting hidden costs

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<sup>21</sup> The average wage is 25.3 under full and 21.4 under limited discretion. The highest wage under limited discretion is 27. If we consider only the interval  $w \in [20, 27]$ , then the average wage under full discretion falls to 22.2 and the average effort to 7.1. This is close to the average effort of 6.9 under limited discretion and not significantly different (t-test, controlling for individual fixed effects and clustering on employees,  $p=0.487$ ). In the other two high wage cases (base treatment and screening treatment with low reputation agents) the average wage is also not higher under limited discretion. Hence, differences in average wages cannot explain the identical average effort levels in these cases.

<sup>22</sup> In regression (4) of Table 2, we also investigate whether employees with a good reputation reacted differently to being controlled than low reputation employees. Employees with a good reputation might react especially averse to limited discretion. However, the coefficients of the interactions between medium and high reputation and “limited” are both small and insignificant.



of control are not sufficiently large to render job offers with full discretion optimal, neither in the base treatment nor for low reputation employees in the screening treatment. Moreover, in our setting, hidden costs of control are not a necessary prerequisite for the optimality of job offers with full discretion for medium and high reputation employees.<sup>23</sup>

#### 4.4 Actual Job Offers, Labor Market Segmentation, and Total Surplus

The previous results show the conditions under which either the trust or the control strategy is profit maximizing, and also the reasons for the respective optimal job design. But we have not yet reported whether the employers choose their employment strategies optimally. The next result addresses this question.

##### **Result 4 (employers' actual job offers):**

- (a) In the base treatment, the large majority of employers converge towards optimal behavior and implement the control strategy.*
- (b) In the screening treatment, employers behave optimally in the majority of cases and condition their strategy on the employees' reputation, i.e., if they face low reputation employees, they use the control strategy in the large majority of cases, while they utilize the trust strategy in more than half of the cases if they face medium or high reputation employees.*

To support Result 4, we report the relative frequency of job offers with full discretion in the different conditions. We know from Result 1 that a job with full discretion is associated with the trust strategy, while a job with limited discretion is associated with the control strategy. Figure 3 shows the share of full discretion job offers over time.

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<sup>23</sup> To see this, consider the relevant wage interval ( $20 \leq w$ ) for medium and high reputation employees. In this interval, the average effort for jobs with full discretion is about 8, yielding revenue of about  $5 \times 8 = 40$ . Now consider jobs with limited discretion and *assume* that hidden costs of control are completely absent. This implies that average effort increases because none of the employees reduces his effort relative to the full discretion case. Assume further, for the sake of the argument, that limiting discretion increases *every* employee's effort by 2 (minimum effort increases from 1 to 3). Average effort would then be 10, yielding revenue of  $4 \times 10 = 40$ , which just matches revenue under full discretion. Clearly, limiting discretion would raise average effort by less than 2 because with an average effort of 8, only some agents can choose an effort below the threshold of  $e=3$ ; there might, however, be a small positive effect of inequity aversion on effort. Limited discretion jobs would thus still not be more profitable than full discretion jobs, even under the complete absence of hidden costs. Hence, these costs are not a necessary prerequisite for the optimality of full discretion jobs in our experimental setting.

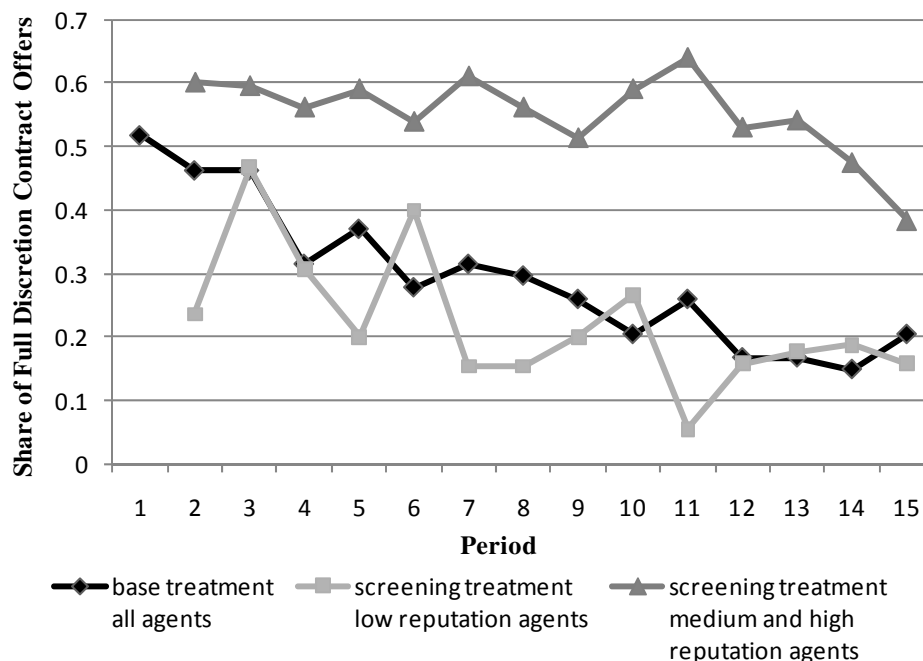


FIGURE 3.—Share of Full Discretion Contract Offers over Time.

In the base treatment, the share of contract offers with full discretion starts out at 50 percent, but falls to less than 20 percent over time, indicating that many employers experimented with the trust strategy but learnt over time that this strategy is not profitable. Figure 3 shows that a very similar picture emerges in the screening treatment if employers face low reputation employees. However, employers offer full discretion contracts much more frequently to employees with a medium or high reputation. The overall share of job offers with full discretion is 55 percent for these employees and it falls below 50 percent only in the last two periods. According to a Fisher exact test, the share of full discretion job offers is significantly higher for medium and high reputation employees compared to low reputation employees ( $p \leq 0.001$ ), and compared to the base treatment ( $p \leq 0.001$ ).

Although employees with a medium or high reputation face the trust strategy in the majority of cases, they are also offered non-optimal contracts with limited discretion in 45 percent of the cases. This raises the question about the sources of this sub-optimality.

**Result 5 (suboptimal behavior and labor market segmentation):**

*(a) The frequency of optimal behavior is higher in the base treatment than in the screening treatment because a significant minority of employers do not condition their job offer on the employees' reputation but always follow the control strategy.*

*(b) A significant share of narrowly self-interested employees do not reciprocate high wages with high effort in the screening treatment, implying that they are permanently stuck with "bad" jobs with limited discretion.*

Result 5a is supported by the fact that almost 17 percent of employers (9 out of 54) always opt for the control strategy in the screening treatment and another 4 percent (2 out of 54) choose the trust strategy only once.<sup>24</sup> These non-responsive employers may have had very pessimistic beliefs about their employees' effort choices or they may have been highly risk or betrayal averse. Since they do not condition their strategy on employees' reputation, their average profits are 42 percent lower than the profits of employers who respond to their employees' past behavior – a difference that is highly significant (t-test, clustering on employers,  $p \leq 0.001$ ).

Employers who never trust and always implement the control strategy induce employees who would have worked hard for a generous wage to provide low effort. Furthermore, the incentives for employees to acquire a good reputation are diminished since not all the employers condition their job offers on reputation. However, acquiring a good reputation remains profitable: employees with a high reputation earn on average 82 percent more than employees with a low reputation and 25 percent more than employees with a medium reputation (t-tests, clustering on employees,  $p \leq 0.001$ ). Support for Result 5b is provided in Section A1 of the supplementary appendix we show that about 20 percent of the employees did not reciprocate to high wages in the screening treatment even though this would have been profitable, i.e., these employees can be characterized as "narrowly self-interested."

Result 5 explains why a substantial fraction of both good and bad jobs co-exist in the screening treatment. This finding is reminiscent of the literature on dual labor markets, which provides a stylized description of actual labor markets in terms of a primary and a secondary market (e.g., Doeringer and Piore 1971). In the primary market, employees enjoy higher wages

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<sup>24</sup> A closer look at the data shows the non-responsive employers did not face a worse distribution of employees than the responsive employers: the non-responsive employers faced on average employees with a reputation index of 5.25, while the responsive employers faced on average employees with an index of 5.23.

and job security, while low wages, high turnover, and low job security prevail in the secondary sector. Bulow and Summers (1986) and Saint-Paul (1997) explain the existence of dual labor markets with efficiency wage theories based on differences in monitoring costs or employment adjustment costs across the two sectors. In these models, technological factors are the source of dual labor markets. In our experiment, however, there are no technological differences. Our findings suggest that individual characteristics of employers and employees (their willingness to trust and to behave trustworthily) may also contribute to the segmentation of the labor market.

Despite the existence of a substantial minority of employers and employees behaving sup-optimally the screening treatment provides incentives to spend high effort and to offer jobs with full discretion. Therefore, total surplus is positively affected by the screening opportunity, which is stated as the next result.

**Result 6 (screening and total surplus):** *The screening opportunity causes a strong increase in total surplus, which is primarily reaped by the employers.*

The impact of the screening treatment on the employers' and employees' average income can be inferred from Figure 4. The figure shows that both employers and employees benefit on average from the screening opportunities. For the employers, the increase in average per period income is highly significant (rank-sum test on matching group averages,  $p=0.004$ ; recall that both in the base and in the screening treatment we have six matching groups), while the null hypothesis of equal incomes across treatments cannot be rejected for the employees (rank-sum test on matching group averages,  $p=0.200$ ). Overall, the total average per period surplus is 58 percent higher in the screening treatment – a difference that is highly significant (rank-sum test on matching group averages,  $p=0.007$ ). This increase in the total surplus has two main sources – the higher share of jobs with full discretion and the higher average effort of the employees. In fact, in accepted contracts we observe a significant increase in average effort from 3.70 in the base treatment to 5.10 in the screening treatment (rank-sum test on matching group averages,  $p=0.004$ ).<sup>25</sup>

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<sup>25</sup> Moreover, the fraction of accepted contracts is slightly higher in the screening treatment than in the base treatment (0.88 vs. 0.81; rank-sum test on matching group averages,  $p=0.077$ ).

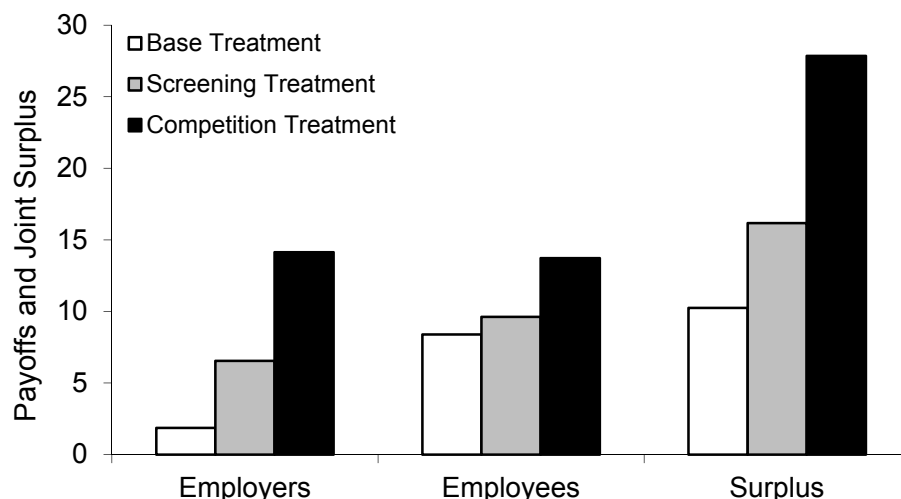


FIGURE 4.—Employers’ profits, employees’ incomes, and surplus in the different treatments.

The effort increase represents the joint effect of employers’ and employees’ behavior in the screening treatment. Since the majority of employers condition their strategy on the performance signals, the employees have an incentive to provide high effort in response to high wages. And since a good reputation is a reliable signal for the willingness to reciprocate generous wages with high effort, the employers need not fear shirking if they pay high wages and offer full discretion jobs. Thus, the actions of the responsive employers and the reciprocating employees mutually reinforce each other and lead to the provision of higher effort levels and a majority of jobs with full discretion, which both increases total surplus.

#### 4.5 Labor Market Competition

Our screening treatment identifies the causal impact of screening opportunities in a bilateral bargaining environment. In most labor markets, competition and screening interact in intricate ways. Since they almost always exist simultaneously it is difficult to identify how competition shapes the employers’ screening activities and employees’ reputation formation behavior in field data. Our laboratory setting enables us to study this question cleanly by conducting an additional treatment that introduces competition among the employees for good job offers and among employers for good employees. The competition treatment also allows us to answer the question whether competition renders the control strategy or the trust strategy more efficient.

Our competition treatment has the following features. At the beginning of each of the 15 periods, groups with four randomly selected employers and four randomly selected employees

are matched. Each employer observes all four employees' performance signals, and then must make a contract offer to each of the four employees. Since an employer can only employ one employee, the employers also specify the order in which the four employees receive their respective offers. There are four matching rounds in every period in order to match employers to employees. In the first round, each employer's most preferred employee receives the offer, meaning that any one employee might receive several offers (up to four), just one offer, or none. The employees who received offers in this round then decide whether to accept any of these offers, but nobody may accept more than one. Employers whose offers are rejected and employees who did not receive or accept an offer enter the second round. In this round, the remaining employers' second preferred employees receive an offer. This process continues in rounds 3 and 4.<sup>26</sup>

As in the previous treatments, employees do not observe the offers received by the other employees. However, an employee may have to wait until the second, third, or even fourth round before getting his first offer, from which he may conclude that he is no employers' first choice. Similarly, as in the previous treatments, employers do not observe the contract offers other employers make. However, if an employer's offers are frequently not accepted during the early matching rounds, he may conclude that other employers offered more attractive contracts. Both effects foster learning. Note that this learning opportunity captures a feature of most labor markets in the field because employees with a low reputation presumably also have more difficulties finding a job in these markets, and employers who offer less attractive jobs have to wait longer to fill their vacancies.

We showed in Section 4.1 that the employers offer two very distinct bundles of job characteristics both in the base and in the screening treatment. The same dichotomy of job characteristics prevails in the competition treatment. Contract offers with full discretion are associated with much higher wages (24.7 vs. 12.8), higher requested effort levels (9.4 vs. 6.8), and significantly higher shares of the surplus (0.40 vs. 0.31). The differences in job characteristics across contracts with full and limited discretion are highly significant in all three dimensions (t-tests, controlling for individual fixed effects and clustering on employers,  $p \leq 0.002$ ). The bundling of distinct job characteristics into good and bad jobs is thus a robust

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<sup>26</sup> We introduced competition only in the screening treatment and not in the base treatment because competition cannot make any difference in the latter. All employees look identical without performance signals, and employers cannot discriminate between them.

phenomenon that occurs under all treatment conditions. In addition, the profit maximizing job design is as in the screening treatment. In accepted contracts, for low reputation employees, low wages and limited discretion are optimal, while for medium and high reputation employees profits are maximized by offering high wages and full discretion.

To what extent do the employers choose the optimal strategy in the competition treatment? Result 7a shows that this is done to a much larger degree than in the screening treatment.

**Result 7 (competition substantially increases the share of good jobs):**

- (a) In the competition treatment, almost all high reputation employees receive “good” job offers and almost all low reputation employees get “bad” job offers.*
- (b) The large majority of employees works hard and acquires a high reputation.*

Result 7a is supported by the left graph of Figure 5, which illustrates the share of job offers with full discretion for employees with different reputations in the screening and the competition treatments.<sup>27</sup> The higher an employee’s reputation in the screening treatment, the more often he receives a job offer with full discretion (in 21, 52, and 59 percent of the cases, respectively). The competition treatment strongly reinforces this pattern. Employees with a high reputation are now considerably more likely to receive offers with full discretion (in 79 percent of the cases), while employees with a low or medium reputation receive fewer such offers than in the screening treatment (only in 8 percent and 27 percent of the cases, respectively).<sup>28</sup> The treatment differences in the share of full discretion contracts are highly significant for medium and high reputation agents (Fisher exact-test,  $p \leq 0.001$ ) but not for low reputation agents ( $p = 0.180$ ).<sup>29</sup> One reason for the higher frequency of good job offers for high reputation employees in the competition treatment is that the acceptance probability more than doubles when a contract with full discretion instead of a contract with limited discretion is offered to a high reputation

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<sup>27</sup> In the competition treatment, we consider only offers that employees actually received because this accounts for the order in which employers made their offers to the employees. If an employer had a match in an early matching round, his contract offers for the remaining matching rounds are not taken into account. Similarly, if an employee accepted an offer in an early matching round, the offers that he might have received in later matching rounds are also not taken into account.

<sup>28</sup> Section A4 of the supplementary appendix further shows that the pattern of contract offers in the competition treatment is stable over time.

<sup>29</sup> There are only few observations with low reputation agents in the competition treatment; only 2 out of 23 such employees received a job offer with full discretion.

employee, while in the screening treatment this increase is only 34 percent. A rank-sum test on the probability increase in matching groups shows that the difference is significant ( $p=0.055$ ; recall that we have only four matching groups in the competition treatment). Competition thus increases the employers' incentives to offer full discretion rather than limited discretion jobs to attract high reputation employees. Moreover, given an offer is accepted, in the competition treatment employers realize 27 percent higher profits with full discretion contracts and high reputation employees compared to the screening treatment (rank-sum test on matching group averages,  $p=0.019$ ).

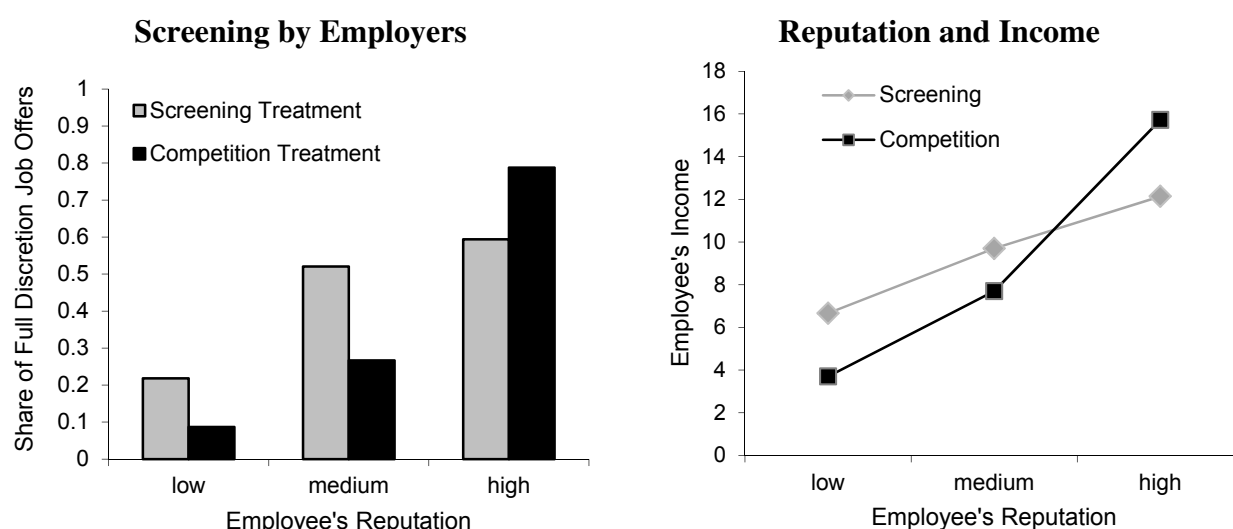


FIGURE 5.—Employers' sorting behavior across the reputation and competition treatment (left graph) and the consequences for employees' incentives for reputation formation (right graph).

The stronger dependence of job offers on employees' reputations has important consequences for the employees' incentives to build a good reputation. Since jobs with full discretion are associated with higher rents, the employees in the competition treatment have a stronger incentive to acquire a good reputation. This effect is indicated in the right graph of Figure 5, which depicts the employees' average per period income as a function of their reputation. The graph mimics the qualitative pattern of the left graph because the increase in income from building a high instead of just a medium or a low reputation is much larger in the competition treatment than in the screening treatment. The treatment differences in employees' incomes are significant in each of the three reputation classes (t-tests,  $p=0.036$ ,  $p=0.017$ , and  $p\leq 0.001$  for low, medium, and high reputation, respectively).



Did the employees' respond to these stronger incentives by acquiring higher reputation levels? Result 7b shows that this is indeed the case. The average reputation of an employee is 5.24 in the screening treatment and 8.31 in the competition treatment (t-test;  $p \leq 0.001$ ). For example, more than 80 percent of the employees (26 out of 32) in the competition treatment have on average a reputation index exceeding  $r=6.5$  ("high reputation"), while only 30 percent of the employees (16 out of 54) in the screening treatment acquire on average a high reputation (Fisher exact-test;  $p \leq 0.001$ ). In addition, only one of the 32 employees in the competition treatment displays on average a low average reputation (i.e.,  $r < 3.5$ ) while about a quarter of the employees (13 out of 54) in the screening treatment fall into this category (Fisher exact-test;  $p=0.014$ ).

The above results show that labor market competition increases the employers' incentives to offer full discretion contracts to high reputation employees, which in turn strengthens the employees' incentives to acquire a high reputation. Therefore, the competition treatment induces employers to rely more on the trust strategy and employees to behave more trustworthily. This largely reduces the secondary sector of the labor market. With regard to the provision of good jobs, screening and competition can therefore be viewed as complements: competition reinforces the incentives for screening, which ultimately causes a much higher share of good jobs.

When competition is added to the screening opportunities, the overall share of jobs with full discretion increases to 77 percent relative to the 51 percent in the screening treatment; in periods 10-14, when reputation incentives still exist and subjects had time to learn the mechanisms of reputation formation under competitive conditions, this share even reaches 82 percent compared to 49 percent in the screening treatment. These treatment differences are highly significant (Fisher exact-tests;  $p \leq 0.001$ ) and led to a substantial increase in welfare.

**Result 8 (competition and total surplus):** *The introduction of competition in addition to screening causes a substantial increase in total surplus. Both sides of the market, employers and employees, significantly benefit from competition.*

Evidence for the last result comes from Figure 4. Both the employers' average profit and the employees' average income per period are higher in each of the four matching groups of the competition treatment than in all six matching groups of the screening treatment (rank-sum tests on matching group averages yield  $p=0.011$ ). Overall, the total per period surplus is 72 percent

higher in the competition treatment than in screening treatment and 172 percent higher than in the base treatment. The increase in total surplus is also driven by a significant increase in average effort in accepted contracts, which amounts to 8.02 in the competition treatment. The differences to the base (3.70) and the screening treatment (5.10) are again significant (rank-sum tests on matching group averages,  $p=0.011$ ).

## 5 Discussion

There is a large empirical literature in industrial relations and personnel economics documenting the prevalence and profitability of HPWS in many industries (e.g., Osterman 1994; Ichniowski and Shaw 2003; Lazear and Oyer 2010). This literature identifies empirical characteristics of HPWS, of the firms that are using them, and of the industries they are operating in. However, it is still not fully understood why and under what conditions HPWS are viable. Why are HPWS more common in some industries than in others? Why do HPWS and more traditional forms of workplace organization sometimes coexist in the same industry? The empirical literature shows that certain workplace and industry or firm characteristics are highly correlated. However, with field data it is difficult to show the causal links between these factors.

The most important contribution of our experimental analysis is the identification of *causal* determinants of good jobs that pay high wages and provide full effort discretion. By exogenously changing the screening opportunities of firms and the degree of labor market competition and by assigning subjects randomly to the different treatment conditions we can show that these factors cause the emergence of good jobs. In addition, our data allow us to *explicitly* identify the complementarities between screening, efficiency wages, and effort discretion as the pathway through which the screening opportunity and labor market competition exert their causal effects. This sheds new light on the fundamental questions raised above. In this section we relate our experimental results to the existing empirical evidence on HPWS, pointing out the new insights that we obtain, but also the limitations of our analysis.

Our analysis shows that screening, efficiency wages, and effort discretion are positively correlated *because* they are complements. Figure 2 shows that there are two local profit maxima in the space of job characteristics. It is a local profit maximum if firms pay low wages ( $w < 10$ ), limit discretion, and do not screen workers. Given that wages are low, profits are substantially higher with limited discretion than with full discretion, a fact that holds for all types of

employees regardless of their reputation levels. Since all employees behave similarly under low wages, screening workers provides no benefits. If firms do not screen, paying higher wages to all employees is unprofitable because most employees shirk. Thus, any local deviation from this bundle of job characteristics reduces profits. However, there is a second local profit maximum if firms screen employees *and* offer full discretion to employees with a good reputation only *and* pay them high wages. Given that wages are high ( $w \geq 20$ ), profits are substantially lower if discretion is limited. Profits are also reduced if the employer does not screen workers but offers high wages to all of them. Furthermore, if full discretion and high wages are offered to employees with a good reputation, profits are reduced if the employer cuts their wages because these employees reciprocate by exerting less effort. Again, any local deviation from this bundle of job characteristics reduces profits. Our results thus indicate that job discretion is profitable only if firms are willing to pay high efficiency wages and vice versa – a finding that strengthens our confidence that the positive correlation between wages and HPWS found in many studies (e.g., Osterman 2006) is caused by the complementarity between high wages and HPWS.

In our experiment the global maximum is the one where good jobs are offered. However, it is difficult for subjects to figure this out. Several authors in the HRM literature (e.g., Pil and MacDuffie 1996) have pointed out that employers may limit their search for better solutions to merely local improvements over their current HRM system. But, as the previous paragraph documents, local search, and the associated marginal changes, will not be profitable; as a consequence, employers may completely refrain from moving towards HPWS. In this case, the spreading of HPWS will be driven by entry of new firms using innovative work systems and exit of traditional firms. This implication is consistent with the pattern that HPWS are common in “greenfield” and “reconstituted” sites but not in “brownfield” sites (Ichniowski and Shaw 2003).

A prominent alternative theory that explains the correlation between high wage rents and high discretion (i.e., little monitoring) is based on differences in monitoring costs and uses a variant of efficiency wage theory (e.g., Akerlof and Yellen 1986). If monitoring costs are high, it is more profitable for firms to rely on wage rents and the firing threat as a worker discipline device, which implies that jobs are characterized by high wages and little monitoring. In contrast, if monitoring costs are low, it is more profitable to pay low wages and to discipline workers via monitoring. This means that there is also a bundling of job attributes that may lead to the co-existence of good and bad jobs, but this heterogeneity requires variations in monitoring

technology. The empirical evidence, however, suggests that good and bad jobs coexist in the same industry despite the absence of apparent technological differences.<sup>30</sup> Our approach is capable of explaining these differences because it relies on a very different mechanism. In our set-up, employers have to trust their employees to provide high effort and employees have to be trustworthy either for intrinsic or for strategic reasons. Employers who do not trust their employees will not provide good jobs, and employees who are narrowly self-interested will not invest in reputation formation. Hence, differences in personal characteristics of employers and employees (their willingness to trust and to behave trustworthily) are sufficient to generate the co-existence of good and bad jobs in our setting.

Many empirical studies stress the importance of screening for the viability of good jobs (see, e.g., the literature discussed in Ichniowski and Shaw 2003 and Oyer and Schaefer 2010). These studies typically do not distinguish between screening for skills and screening for personal characteristics. Our results suggest, however, that it is the screening for “work attitude” or “work ethic” that is a key causal determinant for the viability of good jobs. Recent findings by Huang and Cappelli (2010) support our results and interpretations of screening. Using a national sample of US employers, they examine the extent to which firms screen applicants for work ethic as well as for skills and work experience. In particular, screening for work ethic is associated with greater employee autonomy, which results in increased opportunities for shirking, less supervision of employees, and higher rent-sharing. In contrast, screening for more traditional human capital measures does not produce these correlations. Thus, it is screening for “work ethic” rather than screening for specific skills that is highly correlated with HPWS. However, Huang and Cappelli acknowledge that their data do not permit causal inferences because they are cross sectional.<sup>31</sup>

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<sup>30</sup> For example, there do not seem to be any technological differences between Costco and Wal-Mart’s Sam’s Club, but Costco pays 40 percent higher wages, offers much more generous benefits, on-the-job training, and more job security. However, taking employee productivity into account (sales per employee), Costco’s labor costs are lower than those of Sam’s Club. Furthermore, if anything, Costco seems to be somewhat more profitable than Sam’s Club. See Cascio (2006) for a detailed case study. For other examples, see Osterman (2009, p. 29) and the references cited there.

<sup>31</sup> The importance of screening for work attitude is also shown by case studies on the implementation of HPWS in individual companies such as, e.g., Southwest Airlines. O’Reilly and Pfeffer (2000) report that the Southwest Airlines CEO explains his company’s recruitment strategy as follows: “We draft great attitudes. If you don’t have a good attitude, we don’t want you, no matter how skilled you are. We can change skill levels through training. We can’t change attitude” (p. 38). Ichniowski et al. (1997) also stress the importance of screening for personality traits. Their study includes the following question: “*Was an extensive selection procedure used to hire new workers, including tests for personality traits needed for cooperative team environments and efforts to set clear expectations*

Our paper also suggests that variation in the intensity of labor market competition for workers is an important determinant of the viability of HPWS. Industrial relations that prevent employers from selecting workers according to information about work attitude are an obstacle for the introduction of HPWS. If unions enforce closed shops that prohibit firms from employing non-union members, or if they enforce inside hiring based on seniority rather than merit, HPWS may be discouraged. If the firm's selection of employees is constrained, employees have lower incentives to invest in a good reputation. This is consistent with the empirical evidence reported in Ichniowski et al. (1997), showing that unionization is highly negatively correlated with all other innovative HRM practices in the steel industry,<sup>32</sup> and with Liu et al. (2009), who conduct a multi-industry survey in Ireland, finding that an increase in union representation leads to a significant decrease in the use of HPWS. However, these papers do not identify the causal mechanism that drives this effect. Our findings suggest that it is not unionization per se but particular interventions in the hiring or promotion process that inhibit the introduction of HPWS. This may explain why unionization displays no negative impact on the adoption of HPWS in some studies (e.g., Osterman 1994). Future work will thus benefit from information about how exactly unions and other stakeholders affect the screening, hiring, and promotion processes in firms.

The main limitation of our empirical study is that it is restricted to two causal factors (screening and competition) among many potential factors that may affect the viability and dissemination of HPWS. The empirical literature has pointed to many other factors such as firm size, monitoring cost, the extent of integration in international markets, whether firms primarily compete by reducing cost or by increasing product quality, the skill requirements of technology, whether it operates in a high profit industry, whether firm owners put special weight on employee welfare, and the degree to which firms' output relies on computer technologies (see Osterman 1994; Ichniowski and Shaw 2003; Lazear and Oyer 2010; and the references therein). An experimental study will never be able to fully address all these factors. However, it may be very useful to single out specific factors, to test whether they have a causal impact, and to analyze the pathway by which they effect the functioning of HPWS.

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*about required work behaviors of the new workers?"* This screening variable is highly correlated with all other HRM practices used in HPWS. Furthermore, the authors report that the "isolated" correlation between screening and productivity is small, but large in conjunction with complementary HRM practices such as training, team work, flexible job assignments, and employment security.

<sup>32</sup> The correlation table is provided in the working paper version of this paper, Ichniowski et al. (1995, Table 2).

## 6 Conclusions

Lenin is right – up to a point: Offering discretion to an agent invites shirking and is not profitable on its own. However, if offering discretion improves the agent’s productivity, if it is combined with paying a high wage that grants a substantial rent, and if the principal can screen the agent based on past behavior and restrict such job offers to agents with good reputations, this combined trust strategy becomes profitable and outperforms a job strategy based on control. Our experiments show that offering discretion, paying high wages, and screening are complements that reinforce each other. This leads to an endogenous clustering of job attributes into “good” jobs, which are characterized by high effort discretion, high effort demands, high wages, and a high share of the surplus, and “bad” jobs, which are characterized by low effort discretion, low effort demands, low wages, and a low share of the surplus.

The opportunity for employers to screen employees and for employees to build a reputation is a treatment variation in our experiments. This enables us to show that screening and reputation formation opportunities are causal for the viability of good jobs. However, even if employers can screen employees, not all of them offer good jobs to employees with a good reputation – even though this would increase their profits. Also, not all employees acquire a good reputation – even though this would increase their overall incomes. The interaction of heterogeneous employers and employees leads to a segmented labor market. Our second treatment variation shows that if screening is complemented by labor market competition, suboptimal behavior is largely removed, which causes a considerable increase in the share of good jobs and the share of employees with a good reputation. This results in large welfare gains for both employers and employees.

Our experimental results complement the empirical literature by showing that screening and competition are causal factors for the viability and dissemination of “good” jobs. We hope that our paper stimulates new empirical research. For example, it would be interesting to better understand how firms screen employees. What is the importance of technical skills as compared to soft skills (reliability, trustworthiness, intrinsic motivation, etc.)? How do firms use reference letters, employee referrals, interviews, and tests to evaluate the personality traits of an applicant? Are personal recommendations and letters of reference more reliable in small communities, where employers are more likely to know each other than in large metropolitan areas? What determines the intensity of screening? How does the thickness of the relevant labor market affect

the dissemination of HPWS? Is this affected by legal constraints, such as non-compete agreements, or other barriers to labor mobility? These are important and fascinating questions for future research.

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# Screening, Competition, and Job Design:

## Economic Origins of Good Jobs

### --- Supplementary Appendix ---

#### A1 Behavioral Types among Employees

We document a rough classification of the types of employees in our base and screening treatments in this section. We acquire this classification of employees by conducting *both* the base and the screening treatments consecutively in every session (in the sessions in which we conducted the competition treatment, only the competition treatment was played). When the subjects were playing the first treatment, they did not know that a second treatment would be played subsequently. The fact that we conducted the later second treatment thus cannot have influenced the subjects' behaviors in the first treatments. Subjects retained their roles as either employer or employee in the second treatment. We only use the data from the respective first treatment in the paper itself, in order not to confound the results with possible order effects. In this section, however, the fact that all employees participated in both treatments enables us to derive a type classification that accounts for possible behavioral differences under different treatment conditions.

In Section 3 of the paper, we claim that about 70 percent of our subjects in the base treatment can be classified as selfish and 30 percent as fair (see footnote 11). In Result 5b, we claim that there were narrowly self-interested types among the employees who did not reciprocate generous wages with high effort levels. To determine the different employee types, we compute the following reciprocity index  $\lambda_i$  for each employee in the base and in the screening treatments.

$$\lambda_i = \sum_{t=1}^{N_i} \frac{e_i^t - \underline{e}_i^t}{e_i^{ft} - \underline{e}_i^t} / N_i$$

The actual effort in period  $t$  is denoted by  $e_i^t$ , the minimum effort employee  $i$  could choose in period  $t$  is denoted by  $\underline{e}_i^t$  (which is 1 if a trust contract was offered and 3 if a control contract

was offered), and  $e_i^{ft}$  denotes the fair effort for employee  $i$  in period  $t$ . The fair effort is the effort level that equalizes the employee's and employer's payoffs given the contract the employer offers, i.e.,  $be_i^{ft} - w = w - e_i^{ft}$ , rounded to the next integer (since only integer values were allowed as effort choices). We only consider cases where the wage was high enough so that  $e_i^{ft}$  exceeds  $\underline{e}_i^t$ .  $N_i$  denotes the number of these periods for employee  $i$  (we have at least one period for each employee in each treatment). Thus, an employee who always chooses the fair effort level  $e_i^{ft}$  has a reciprocity index of 1, while an employee who always chooses the minimum effort level  $\underline{e}_i^t$  has a reciprocity index of 0. We have a reciprocity index for each employee in both the base and in the screening treatments.

The left panel of Figure A1 plots the reciprocity indices for each employee in the base and the screening treatments against each other. We round these indices to natural numbers in the right panel, resulting in three large clusters of employees on the basis of the reciprocity index.<sup>1</sup>

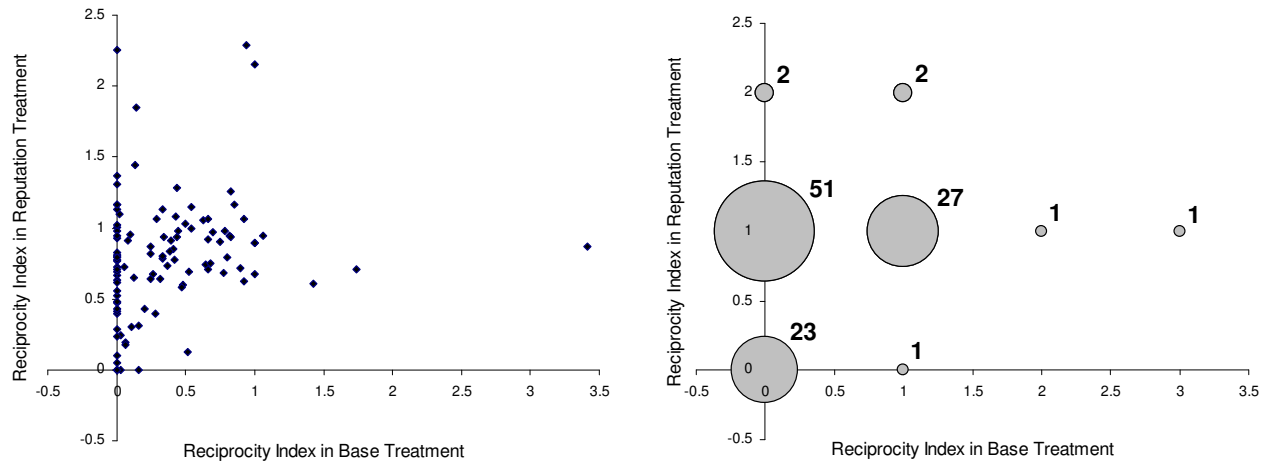


FIGURE A1.—Classification of employees' types. In the left panel, each dot represents one employee. In the right panel, we round the reciprocity indices to natural numbers illustrating our classification of employees' types. The size of the bubbles is proportional to the number of employees in each category.

<sup>1</sup> Note that there is only one employee with an index of one in the base treatment and of zero in the screening treatment, i.e., we only have a single agent who acts reciprocally in the base but selfishly in the screening treatment.

*Narrowly self-interested types:* About 20 percent of the employees (23 out of 108) have a reciprocity index close to zero in both the screening and the base treatments. These employees do not reciprocate high wages with high effort in either treatment, even though this would be profitable in the screening treatment. In the base treatment, they choose an average effort of 2.78 and earn an average payoff of 7.37, a little above the overall average of 6.95. In the screening treatment, these employees choose an average effort of 3.35 and are thus stuck with a low reputation, meaning that they are offered few jobs with full discretion (only in 25 percent of the cases). As a consequence, their average income is only 7.35, considerably less than the overall average income of 9.51.

*Reciprocal types:* About 30 percent of the employees (31 out of 108) have a reciprocity index close to one (or larger) in both treatments. These employees always reciprocate high wages with high effort. They choose an average effort of 4.71 in the base treatment but only earn an average payoff of 6.70. This is a little less than the overall average, but these employees voluntarily choose to sacrifice some of their own payoff in order to reciprocate high wage offers. They spend an average effort of 5.96 in the screening treatment and acquire a medium or high reputation. They are therefore offered more job offers with full discretion (in 46 percent of the cases) and attain an average income of 9.33.

*Strategic types:* About 50 percent of the employees (53 out of 108) have a reciprocity index close to zero in the base treatment and close to one (or larger) in the screening treatment. These employees act strategically and reciprocate if their performance record is observed, but do not do so if future employers are unable to detect low effort. They look like the narrowly self-interested types in the base treatment: They choose an average effort of 3.08, and their average income is 6.85. In the screening treatment, however, they closely approximate the reciprocal types. They choose an average effort of 5.97, acquire a medium or high reputation, and are offered jobs with full discretion in the majority of the cases (52 percent). As a result, they receive a high average income (10.60).

## **A2 Optimal Contracts in the Base Treatment with Inequity Aversion**

In Section 3.2 of the paper we claim that the Fehr-Schmidt (1999) model predicts that contracts with limited discretion and low wages are optimal in the base treatment if the fraction of fair employees is smaller than 60 percent. In this appendix we derive the optimal contract and the

predicted behavior of employers and workers as a function of the fraction of fair-minded subjects in the Fehr-Schmidt model. This model assumes that some players dislike inequality and have a utility function

$$U_i(m_i, m_j) = m_i - \alpha_i \max\{m_j - m_i, 0\} - \beta_i \max\{m_i - m_j, 0\}$$

where  $m_i$  is the monetary payoff of player  $i$  and  $\alpha_i, \beta_i$  reflect the degree to which the player dislikes inequality to his disadvantage and to his advantage, respectively, with  $0 \leq \beta_i \leq \alpha_i$ . A player is called “fair” if  $\beta_i \geq \frac{1}{2}$  and  $\alpha_i \geq 2$ . In a dictator game such a player is willing to share the pie equally and in an ultimatum game he is prepared to reject any offer that gives him less than 40 percent of the pie. A player with  $\beta_i < \frac{1}{2}$  and  $\alpha_i < 2$  is called “selfish.” For simplicity we assume that wages and effort can be chosen continuously and that all fair players have  $0.5 < \beta_i < 1$  and  $\alpha_i = 2$ , and that all selfish players have  $\beta_i = \alpha_i = 0$ . Suppose that fraction  $x$  of players is fair and fraction  $1 - x$  is selfish. Analyzing the game by backward induction, we first ask how the different types of workers behave for any given contract offer:

- At the last stage a selfish worker always chooses  $e = \underline{e}$ , where  $\underline{e}$  is the lowest possible effort level that a worker can choose given the contract, while a fair worker chooses the fair effort  $e^f = \max\left\{\underline{e}, \frac{2w}{b+1}\right\}$  that aims at equalizing payoffs.
- When the employer offers a contract with full discretion a selfish worker will accept any offer with  $w \geq 1$ . A fair worker accepts the contract if

$$w - e^f - \alpha \max\{b \cdot e^f - w - w + e^f, 0\} - \beta \max\{w - e^f - b \cdot e^f + w, 0\} \geq 0$$

Note that  $w - e^f - b \cdot e^f + w = 0$  if  $e^f = \frac{2w}{b+1}$  and it is smaller than 0 if  $e^f = 1$ . Thus the

term multiplied by  $\beta$  is always 0. Substituting  $\alpha = 2$ ,  $b = 5$ , and  $e^f = \max\left\{1, \frac{2w}{b+1}\right\}$  we

get that the fair type accepts a full discretion contract if  $w \geq 2.6$ .

- When the principal offers a contract with limited discretion a selfish worker will accept any offer with  $w \geq 3$ . By the same argument as above (but now with  $b = 4$ ) a fair worker accepts the contract if  $w \geq 6.6$ .

We now ask which contract offer maximizes the monetary payoff of the employer

$$\Pi = x[b \cdot e^f - w] + (1-x)[b \cdot \underline{e} - w].$$

- Suppose the employer offers a contract with full discretion and  $w \geq 3$ . Substituting  $b = 5$ ,  $\underline{e} = 1$  and  $e^f = \max\left\{1, \frac{2w}{b+1}\right\}$  yields  $\Pi = 5 - 5x + \left(\frac{10x}{6} - 1\right)w$ . Note that

$$\frac{\partial \Pi}{\partial w} = \frac{10x}{6} - 1 > 0 \Leftrightarrow x > 0.6. \text{ Thus, if the fraction of fair workers is larger than 60}$$

percent, the employer should choose  $w$  such that  $e^f = \frac{2w}{5+1} = 10 \Leftrightarrow w = 30$ . If  $x \leq 0.6$  the

employer has two possibilities. He can either offer  $w = 1$  which is accepted only by a selfish worker and yields expected profit  $\Pi = x \cdot 0 + (1-x)[5 \cdot 1 - 1] = 4 - 4x$ . Or he can offer  $w = 3$  which is accepted by both types and yields profit  $\Pi = 5 \cdot 1 - 3 = 2$ . The second option yields a higher payoff than the first if  $x \geq 0.5$ . Thus, the profit maximizing full discretion contract offers

$$w^{FD} = \begin{cases} 30 & \text{if } 0.6 < x \\ 3 & \text{if } 0.5 < x \leq 0.6 \\ 1 & \text{if } x < 0.5 \end{cases} \text{ and yields } \Pi^{FD} = \begin{cases} 45x - 25 & \text{if } 0.6 < x \\ 2 & \text{if } 0.5 < x \leq 0.6 \\ 4 - 4x & \text{if } x < 0.5 \end{cases}$$

- Suppose now that the employer offers a contract with limited discretion and  $w \geq 8$ . Substituting  $b = 4$ ,  $\underline{e} = 3$  and  $e^f = \max\left\{3, \frac{2w}{b+1}\right\}$  yields  $\Pi = 12 - 12x + \left(\frac{8x}{5} - 1\right)w$ . Note

$$\text{that } \frac{\partial \Pi}{\partial w} = \frac{8x}{5} - 1 > 0 \Leftrightarrow x > 0.625. \text{ Thus, if the fraction of fair workers is larger than 62.5}$$

percent, the employer should choose  $w$  such that  $e^f = \frac{2w}{4+1} = 10 \Leftrightarrow w = 25$ . If  $x \leq 0.625$

the employer has two possibilities. He can either offer  $w = 3$  which is accepted only by a selfish worker and yields expected profit  $\Pi = x \cdot 0 + (1-x)[4 \cdot 3 - 3] = 9 - 9x$ . Or he can offer  $w = 7$  which is accepted by both types and yields profit  $\Pi = 4 \cdot 3 - 7 = 5$ . The second option yields a higher payoff than the first if  $x \geq \frac{4}{9} = 0.\bar{4}$ . Thus, the profit maximizing

limited discretion contract offers

$$w^{LD} = \begin{cases} 25 & \text{if } 0.625 < x \\ 7 & \text{if } 0.4 < x \leq 0.625 \\ 3 & \text{if } x < 0.4 \end{cases} \text{ and yields } \Pi^{LD} = \begin{cases} 28x - 13 & \text{if } 0.625 < x \\ 5 & \text{if } 0.4 < x \leq 0.625 \\ 9 - 9x & \text{if } x < 0.4 \end{cases}$$

Comparing profits with full discretion contracts to profits with limited discretion contracts we see that if the fraction of fair subjects is smaller than 60 percent, contracts with limited discretion and low wages of either 7 or 3 are optimal. A selfish principal offers a contract with limited discretion and a wage of 3 if  $x \leq 0.4$  because he is interested in his monetary payoff only. A fair employer also offers a contract with limited discretion but with a wage of 7 that gets him as close as possible to equal payoffs. Both types of workers accept this contract offer and choose  $e = 3$ . The fair principal's monetary payoff is then  $3 \cdot 4 - 7 = 5$  and an agent's monetary payoff is  $7 - 3 = 4$ . The principal's utility is thus  $5 - \beta > 4$ . If instead he offers a contract with limited discretion and a wage of 3, his utility is  $(1 - x)(1 - \beta)9$ . Even if  $x = 0$ , the latter exceeds the former only if  $\beta < 0.5$ , but we assume  $0.5 < \beta < 1$  for fair individuals.

### A3 Clustering of Job Attributes

Figure 1 in Section 4.1 of the paper shows the clustering of job attributes. The average wage, the average requested effort, and the average offered share of the surplus are all significantly higher in contracts with full discretion than in those with limited discretion. In this section, we provide additional information showing that the clustering of job attributes is also evident when looking at the distributions of the job attributes (see footnote 15 of the paper).

Figure A2 shows relative frequencies of wage offers in both contract types in the base and the screening treatment, respectively. It is clear that the distribution of wages is very different in the two types of contracts; given the contract type, however, it is qualitatively very similar in both treatments. In limited discretion contracts, the mode of the distribution is at low wages ( $5 \leq w < 10$ ) and higher wages occur monotonically less often. In contrast, the mode of the distribution is at high wages ( $w \geq 25$ ) and lower wages occur monotonically less often in full discretion contracts.



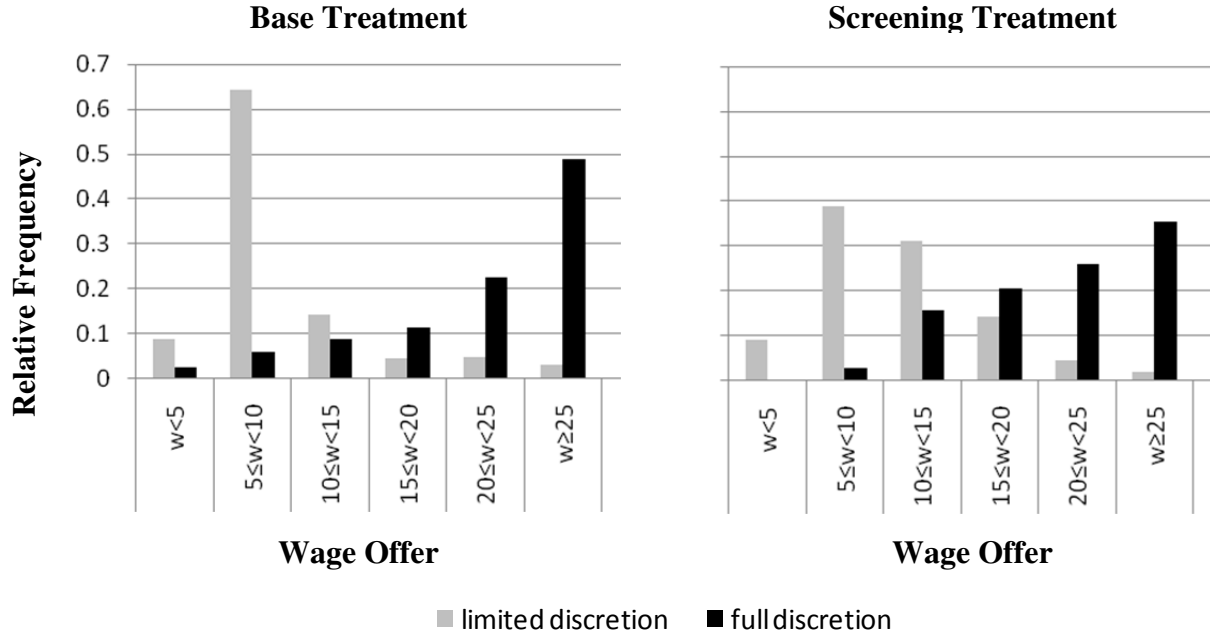


FIGURE A2.—**Relative Frequency of Wage Offers in the Base and the Screening Treatments.**

Figures A3 to A6 provide information about individual contract offers. The figures show the clustering of job attributes separately in both treatments and in both types of contracts. Each bubble in the figures represents a combination of job attributes, and the size of the bubbles indicates the frequency with which a given combination of job attributes was offered. The left panel of Figure A3 shows the combination of wages and requested effort levels in contracts with limited discretion in the base treatment. It is clear that most contract offers cluster at low wage offers and low levels of requested effort. The right panel shows the combination of wages and requested effort levels in contracts with full discretion. In this case, most contract offers cluster at high wage offers and high levels of requested effort. Figure A4 shows that the same clustering prevails in the screening treatment. Figures A5 and A6 show that low wage offers and low shares of the surplus cluster in contracts with limited discretion, while high wage offers and high shares of the surplus cluster in contracts with full discretion; this holds for both the base and the screening treatment.

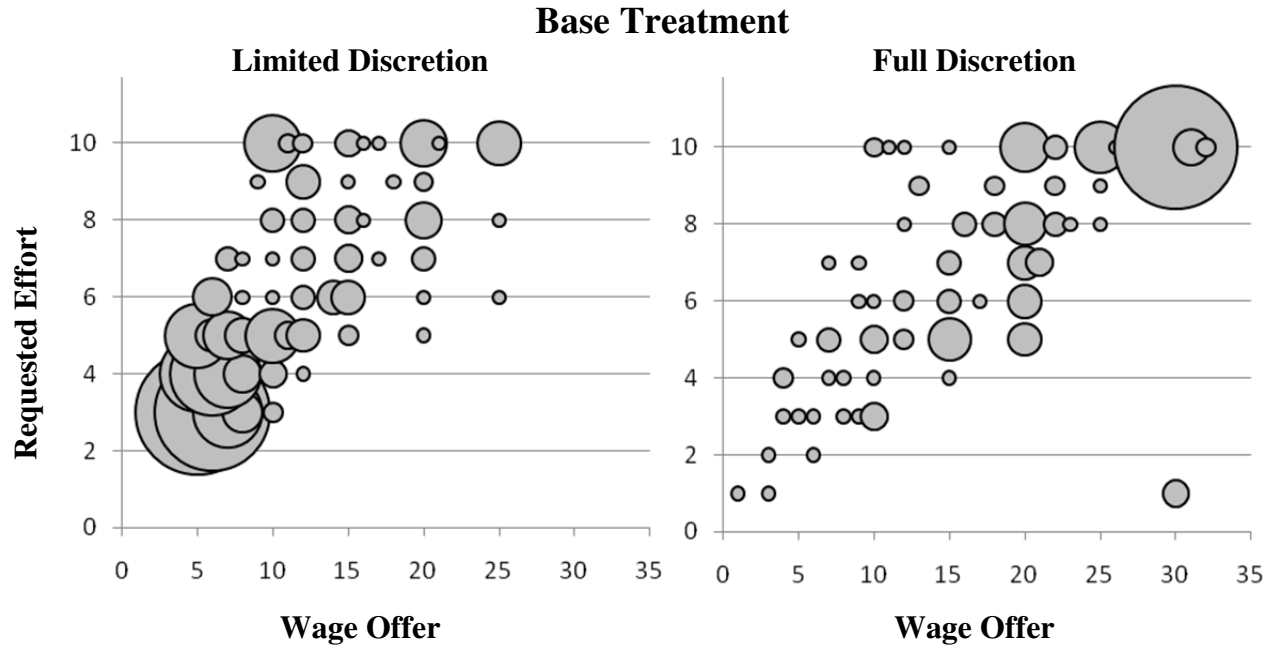


FIGURE A3.—**Wage Offers and Requested Effort in the Base Treatment.** Dots represent contract offers. The size of a bubble indicates the frequency with which a given wage-requested effort combination was chosen.

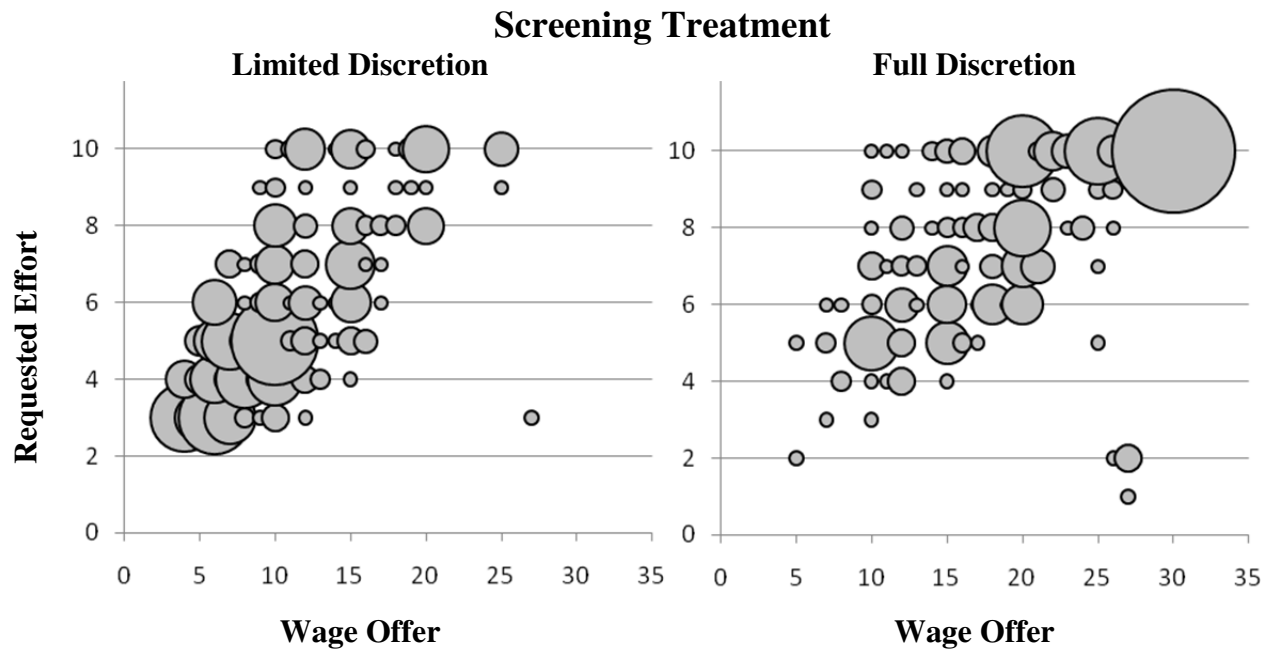


FIGURE A4.—**Wage Offers and Requested Effort in the Screening Treatment.** Dots represent contract offers. The size of a bubble indicates the frequency with which a given wage-requested effort combination was chosen.

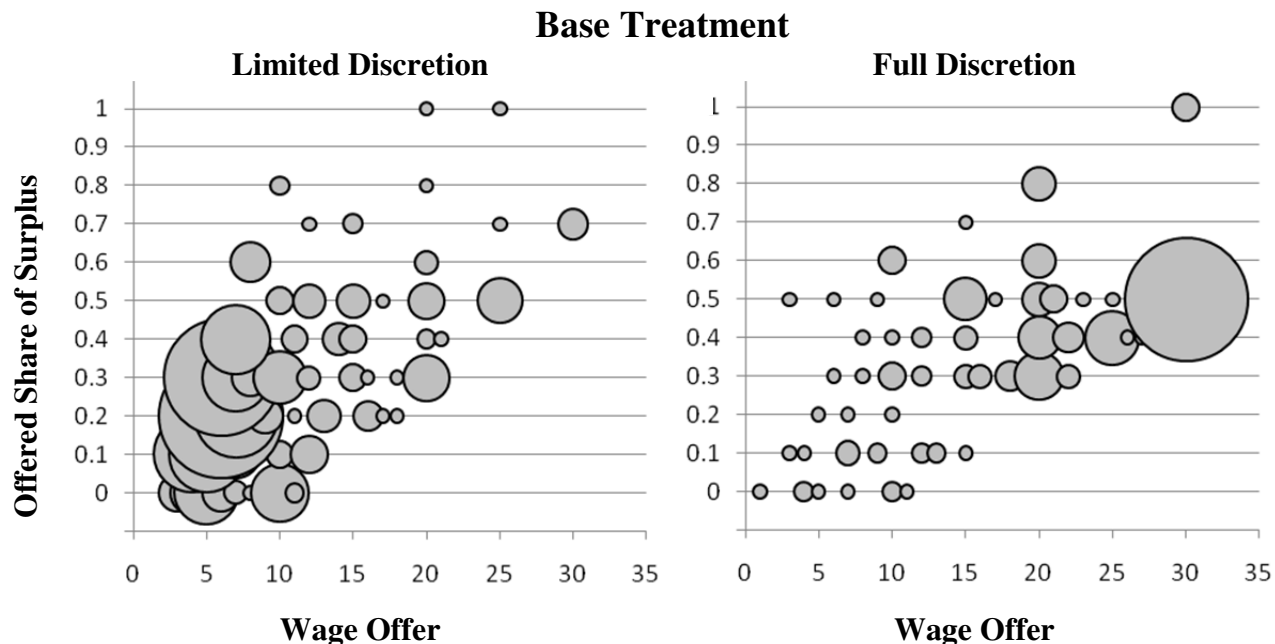


FIGURE A5.—**Wage Offers and Offered Share of Surplus in the Base Treatment.** Dots represent contract offers. The size of a bubble indicates the frequency with which a given wage-share of surplus combination was chosen.

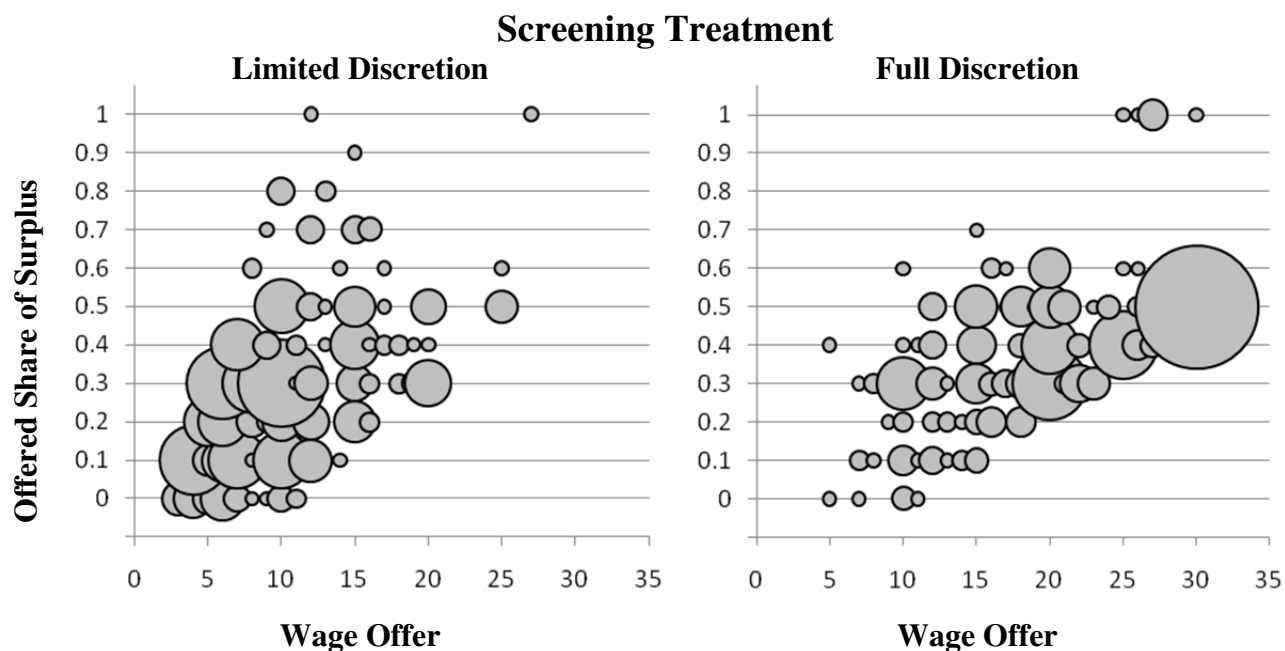


FIGURE A6.—**Wage Offers and Offered Share of Surplus in the Screening Treatment.** Dots represent contract offers. The size of a bubble indicates the frequency with which a given wage-share of surplus combination was chosen.

## A4 Time Effects

In this section we provide more information on time effects. We claim that the clustering of job attributes is stable over time in footnote 15 in Section 4.1 of the paper. We show in Figure A7 that the difference between the two contract types with regard to the wage offer, requested effort level, and offered share of the surplus is not only stable over time but, especially in the base treatment, that it becomes even more pronounced over time.

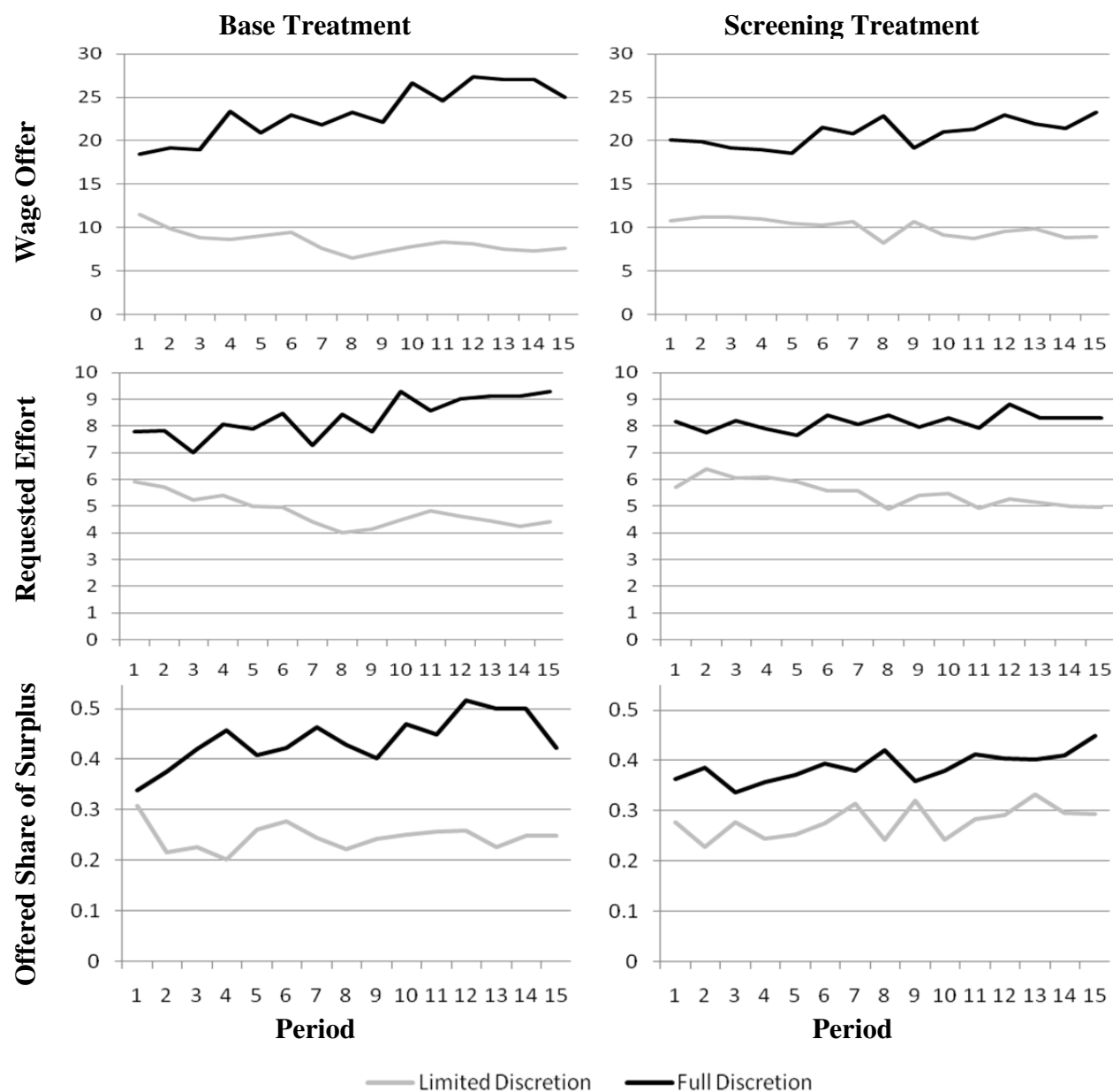


FIGURE A7.—Clustering of Job Attributes over Time.

In footnote 28 of Section 4.5 of the paper we claim that the pattern of types of contract offers is stable over time in the competition treatment. Figure A8 shows the share of full discretion contract offers made to low reputation employees, contrasted to that offered to medium and high reputation employees; the figure thus corresponds to Figure 3 in the paper. We again consider only offers that employees actually received (see footnote 27 of the paper). Figure A8 shows that the fraction of full discretion contract offers made to medium and high reputation agents is stable over time, roughly at values between 70 and 80 percent, but it drops sharply to about 50 percent in the final period. There are almost no full discretion contract offers for low reputation agents. The 100 percent share in the final period is based on a single observation.

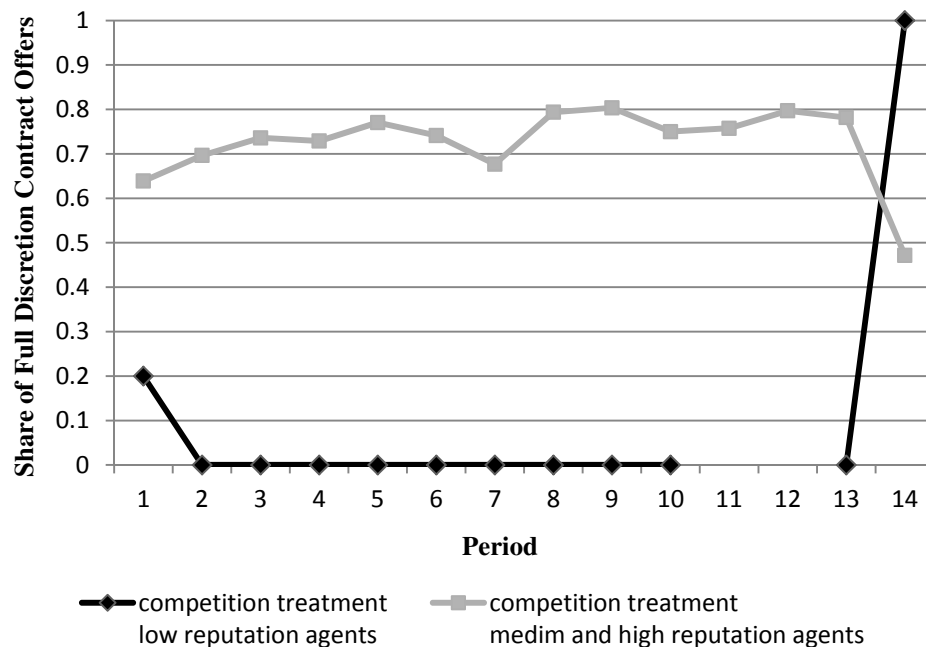


FIGURE A8.—Share of Full Discretion Contract Offers over Time.

## A5 Additional Regression Analyses with Squared Wage Terms

In this section, we analyze the impact of including additional squared wage terms in our regression analyses. Regressions (1) and (3) in Table A1 are the main effort regression and the profit regression for the base treatment, respectively, as reported in Table 1 of the paper. In regressions (2) and (4) “wage squared” and the interaction of “limited” with “wage squared” are added as additional regressors.

Table A1—Effort and Profit Regressions with Squared Wage Terms in Base Treatment

	(1) effort as reported in paper	(2) effort with squared wage terms	(3) profit as reported in paper	(4) profit with squared wage terms
wage	0.207*** (0.030)	0.144** (0.067)	0.007 (0.105)	-0.397 (0.363)
wage squared	—	0.002 (0.002)	—	0.010 (0.011)
limited	2.731*** (0.432)	3.798*** (0.611)	6.535*** (1.766)	2.827 (2.466)
limited × wage	-0.072** (0.032)	-0.311*** (0.095)	-0.263** (0.127)	0.244 (0.436)
limited × wage squared	—	0.009*** (0.003)	—	-0.014 (0.015)
constant	-0.517 (0.482)	-0.021 (0.489)	-1.307 (1.691)	1.912 (2.209)
observations	658	658	810	810
adj. R2	0.474	0.491	0.063	0.064

*Notes:* The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. The effort regressions cluster by employees, control for individual fixed effects, and consider only accepted contracts as no effort is chosen if a contract is rejected. All contracts are included in the profit regressions to capture the effect of rejections on profits.

\*\*\* denotes significance at 1 percent, \*\* at 5 percent, and \* at 10 percent.

In the effort regression (2), the coefficients of both, “wage squared” and “limited×wage squared” are small and positive, and “limited×wage squared” is highly significant. Under contracts with full discretion (the omitted category) the wage effort relation is now slightly convex but basically unchanged (recall that wages almost never exceed 30). Under contracts with limited discretion, the squared wage terms lead to a u-shaped wage-effort relation that is

however basically flat in the relevant wage region between 5 and 10 where almost three quarters of the accepted wage offers with limited discretion are located. The positive but flatter wage-effort relation under limited discretion contracts thus stems from observations with especially high wage offers. In the profit regression, we observe that the coefficient of “wage squared” is positive while the coefficient of “limited×wage squared” is negative. Both coefficients are insignificant. In comparison to the analysis without squared wage terms, we find that the effect of wages on profit under full discretion (the omitted category) is now u-shaped. Almost 90 percent of the accepted wage offers with full discretion are between 10 and 30, and for wages of about 10 and 30 the estimated profit coincides with the linear specification, but wages around 20 lead to even lower estimated profits. As in the linear specification, there is no significant effect of wages on profits, as the coefficient of the linear wage term remains insignificant after the inclusion of the squared wage term. Looking at contracts with limited discretion, the coefficient on limited is now smaller but the regression constant compensates for this effect. The effect of wages on profit is now slightly concave but the relation remains basically unchanged. However, while “limited” and “limited×wage” are significant in the linear specification, none of the coefficients remain significant if the squared wage terms are included. These results show that the impact of wage on effort and profit is not exactly linear, but they also show that the basic pattern of the linear regression results remains unchanged.

Regressions (1) and (3) in Table A2 are the main effort regression and the profit regression for the screening treatment, respectively, as reported in Table 2 of the paper. In regressions (2) and (4) “wage squared” and the interaction of “limited” with “wage squared” are added as additional regressors. In the effort regression (2), the coefficient of “wage squared” is small and negative and the one of “limited×wage squared” is small and positive. Both coefficients are insignificant. In the profit regression (4), the coefficient of “wage squared” is again negative (but now significant at the 5 percent level) and the one of “limited×wage squared” is again small and positive. The table reveals that also in the screening treatment, the impact of wages on effort and profit is indeed not linear, especially the impact of wage on profit has a pronounced concave shape, but it also reveals that the basic pattern of the linear regression results again does not change.

Table A2— Effort and Profit Regressions with Squared Wage Terms in Screening Treatment

	(1) effort as reported in paper	(2) effort with squared wage terms	(3) profit as reported in paper	(4) profit with squared wage terms
wage	0.187*** (0.049)	0.365*** (0.132)	0.065 (0.185)	0.952** (0.414)
wage squared	—	-0.004 (0.004)	—	-0.023** (0.010)
limited	2.478*** (0.571)	4.578*** (1.138)	6.868*** (1.772)	11.765*** (3.755)
limited × wage	-0.105*** (0.038)	-0.375** (0.160)	-0.478*** (0.118)	-0.753 (0.491)
limited × wage squared	—	0.008 (0.005)	—	0.003 (0.016)
medium reputation	-1.560*** (0.537)	-1.518** (0.582)	-1.048 (1.800)	-1.602 (1.852)
high reputation	-2.493*** (0.737)	-2.526*** (0.875)	-4.725** (1.928)	-5.708*** (2.013)
medium reputation × wage	0.102** (0.043)	0.099** (0.046)	0.424** (0.177)	0.451** (0.181)
high reputation × wage	0.143*** (0.050)	0.144** (0.058)	0.722*** (0.177)	0.783*** (0.185)
final period	-1.933*** (0.419)	-1.936*** (0.414)	-7.038*** (1.839)	-7.110*** (1.833)
constant	1.442** (0.719)	-0.168 (1.066)	0.110 (2.231)	-7.589** (3.586)
observations	655	655	745	745
adj. R2	0.676	0.677	0.301	0.310

Notes: The table reports coefficients of OLS regressions. Robust standard errors are reported in parentheses. The effort regressions cluster by employees, control for individual fixed effects, and consider only accepted contracts as no effort is chosen if a contract is rejected. All contracts are included in the profit regressions to capture the effect of rejections on profits.

\*\*\* denotes significance at 1 percent, \*\* at 5 percent, and \* at 10 percent.



## **A6 Experimental Instructions**

Below we provide the English translation of our experimental instructions for the base and the screening treatment. We also provide the translation of the part of the instructions of the competition treatment that explains the matching protocol. We finally provide the original German instructions.

*[Begin of instructions for the employers in the base and screening treatment.]*

### **General instructions for participants**

We are pleased to welcome you to this economic study. If you read the following instructions carefully, you can – depending on your decisions and those of the other participants – earn additional money in excess of the 10 CHF which you receive as an initial endowment for participating. It is thus very important that you read these instructions carefully. If you have questions, please ask them to us. Speaking with the other participants during the experiment is strictly prohibited. Violation of this rule will lead to exclusion from the experiment and from all payments. During the experiment, we will not speak of Swiss francs, but of points. Your entire income will thus first be calculated in points. The total number of points you earn during the experiment will then be converted to CHF at the end of the experiment, where the following exchange rate applies: 10 points = 1.25 CHF. At the end of today's experiment, you will receive the number of points earned during the experiment plus 10 CHF for appearing in cash. We will describe the exact procedure of the experiment on the next pages.

### **The Experiment**

There are two types of participants in this experiment, employers and employees. The participants are equally distributed in these two roles. You play the role of an employer during the entire experiment. The experiment lasts for 15 periods. During each period, a random device assigns one of the employees to you. You will not learn of the identity of the persons assigned to you, neither during nor after the experiment. The other participants will also not be informed of your identity. This will guarantee the complete anonymity of the decisions. Here we will first give you a summary of the course of a period. More detailed information will follow on the next pages.

Each period of the experiment consists of two stages. During the first stage, you as employer determine a labor contract in which you offer your employee the following: 1) You

choose the type of labor contract which you will offer your employee. You can choose between (i) a contract without limitation of the employee's choice possibilities with respect to the work effort; and (ii) a contract with limitation of the employee's choice possibilities with respect to the work effort. 2) You then choose the salary that you wish to offer the employee. 3) Finally, you select the requested work effort.

Your decisions from the first stage will then be notified to your employee. The employee can then react to the contract you offer in the second stage: 1) He or she decides whether to accept or decline the offered contract. 2) If he accepts the labor contract, he decides on the actual work effort. The larger the actual work effort, the greater is your profit. The employee incurs costs, however, from the work effort he chooses; these increase as the actual work effort increases. The period ends after the second stage. The employer's and the employee's decisions determine both your profits as well as the employee's income in this period. There are a total of 15 periods. Your profit in this experiment is thus the sum of your profits over the 15 periods; the employee's entire income is the sum of his income over the 15 periods.

### **Detailed information about the course of a period**

In each period, you choose the type of labor contract that you wish to offer. You may choose between a contract without limitation of the employee's choice possibilities with respect to the work effort and a contract with limitation of the employee's choice possibilities with respect to the work effort. In case of a contract with a limitation of choice possibilities, your employee – provided he accepts the contract – must select a work effort of at least 3. In a contract without limitation of choice possibilities, your employee can also choose a work effort of 2 or the minimum work effort of 1. In addition to the decision on the type of contract, you must also determine the salary offered and the requested work effort. Your employee is not bound to the requested work effort; he may also choose a greater or smaller work effort. In case of a contract with limitation of the choice possibilities with respect to work effort, however, your employee must at least choose a work effort of 3 – provided he accepts the contract. If the employee accepts the contract, you must pay the salary offered in any case, regardless of the worker's actual work effort.

The following applies with respect to the requested and actual work effort: You can choose any integer between 1 and 10 for the requested work effort. The lowest work effort is 1 and the highest is 10. It is not the requested work effort, however, but the actual work effort, that

is decisive for determining the profit which you ultimately earn. In case of a contract without limitation of choice possibilities in work effort, your employee can also choose any integer value between 1 and 10 as his actual work effort. In case of a contract with limitation of choice possibilities in work effort, your employee can only choose any integer value between 3 and 10 as his actual work effort. Your employee is thus forced to select a minimum work effort of 3.

In case of a contract without limitation in choice possibilities with respect to work effort, you will earn 5 points for each actual unit of work effort. If, for example, the actual work effort is 1, you will earn  $5 \times 1 = 5$  points; if the actual work effort is 7, you will then receive  $5 \times 7 = 35$  points, etc. In case of a contract with limitation in choice possibilities with respect to work effort, you will earn 4 points for each actual unit of work effort. If, for example, the actual work effort is 3 (the minimum for this contract), you will earn  $4 \times 3 = 12$  points; if the actual work effort is 7, you will earn  $4 \times 7 = 28$  points, etc.

Thus, there are two differences between the two types of contracts: 1) In case of a contract without limitation in choice possibilities with respect to work effort, your employee can select the minimum actual work effort of 1. In case of a contract with limitation in choice possibilities with respect to work effort, your employee must opt for a minimum actual work effort of 3. 2) In case of a contract without limitation in choice possibilities with respect to work effort, you earn 5 points per actual unit of work effort. In case of a contract with limitation in choice possibilities with respect to work effort, you earn 4 points per actual unit of work effort.

The actual work effort is associated with costs for your employee. Each unit of actual work effort costs your employee 1 point (independent of the type of contract). If the actual work effort is 1, this costs your employee 1 point, if the actual work effort is 2, this costs your employee 2 points, etc. The following applies with respect to the salary offered: the salary offered must cover the costs of the requested work effort. If, for example, you want a work effort of 5, the salary offered must amount to at least 5.

*[The following, grey shaded text is only included in the screening treatment.]*

Before you make your decisions in a period, a table is shown for your information. This table indicates the actual work effort your present employee selected in the last 3 periods. If the employee declined a contract, "contract declined" will appear instead of the actual work effort. You will receive a new table in every period, as a new employee will be assigned to you every period. Your employee also knows that you as employer are aware of the actual work effort he

produced in the last 3 periods. How the table is to be interpreted: The first line of the table (see picture) indicates the actual work effort of your present employee in the last period. The second line indicates the actual work effort in the second to last and the third line the actual work effort in the third to last period. If the contract was declined in a period, you will find the text "contract declined".

*[Screen shot showing the table.]*

The information in the table is incomplete in the first three periods of the experiment, as there are not enough previous periods. The text on this line states, "information not yet available". The information over the last three periods is first complete beginning in period 4.

Once you have made your decisions on the type of contract, the amount of the salary offered, and the requested work effort during the first stage of the experiment, your decisions will be notified to the employee. During the second stage, the employee will then decide whether to accept or to decline the offered contract. If he accepts the labor contract, he then decides on the actual work effort. Once your employee has made his decisions, an informational screen will appear. You will then be informed of your employee's decisions and you will once again see your own decisions. Furthermore, your profit and your employee's income for this period will also be shown. Following this, the next period begins. The experiment runs for a total of 15 periods. A new employee will be randomly assigned to you in every period. (If there are an odd number of participants in the experiment, it can happen that no employee will be assigned to you in one period.)

### **Calculation of profits and income at the end of each period**

Your profit at the end of each period depends both on your decisions and those of your employee during the second stage. Your profit at the end of the experiment is the sum of the profits stemming from the 15 periods. You can be confronted with two possibilities at the end of each period: 1) Your employee declines the contract. In this case, you do not have to pay the salary offered, and your employee cannot choose a work effort. Both your profit and your employee's income amount to 0 points in this period. 2) Your employee accepts the contract. In this case, your profit in points depends on the type of contract, the salary offered, and the actual work effort. The requested work effort does not play any role in the calculation of your profit. A) In case of a contract without limitation in the choice possibilities, your employee can choose an actual work amount between 1 and 10. Your profit is then calculated as follows: Your profit = 5

x actual work effort – salary offered. B) In case of a contract with limitation in the choice possibilities, your employee must choose an actual work amount between 3 and 10. Your profit is then calculated as follows: Your profit = 4 x actual work effort – salary offered. It is thus possible that a loss may be incurred in individual periods if the actual work effort is relatively low and the salary is relatively high. Any losses will be offset with profits from other periods or with the initial endowment.<sup>2</sup> In case of acceptance of the contract, your employee's income in points depends on the salary offered and the actual work effort. An employee's income in a period is calculated as follows: Employee's income = salary offered – actual work effort.

### **Procedure on the computer**

You enter your decision on the type of contract, the salary offered, and the requested work effort on the following computer screen:

*[Screen shown here; in the screening treatment it includes information about an agent's past effort choices.]*

*[The following, grey shaded text is only included in the screening treatment.]*

On the upper part of the screen, you will find the table with information on the actual work effort of your present employee in the last 3 periods. (The example shown here is completely arbitrary.)

In the middle of the screen, you see the two buttons, "Contract without limitation in choice possibilities with respect to work effort" or "Contract with limitation in choice possibilities with respect to work effort". Please click the corresponding button for your decision. Then determine the salary offered; to do so, enter the corresponding number in the upper blue field. Finally, you can determine the requested work effort; to do this, enter the corresponding number in the lower blue field. The salary offered must at least cover the costs of the requested work effort. When you have made your decisions, click the OK button. You can revise your decisions for as long as you have not pressed the OK button. Do you have any questions?

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<sup>2</sup> This footnote was not included in the instructions and we add it here to explain the procedure that applied when subject's accumulated losses exceeded the initial endowment and all possible prior gains. In this case, the subject would see a screen informing her or him of the situation. The subject then has the choice to quit the experiment or to continue. If the subject continues, it might happen the subject has a loss at the end of the experiment and we stressed that the subject would have to pay these losses. We also explained that there are strategies that exclude the possibility of losses. None of our subjects opted out and all of our subjects earned positive profits.

## Test questions

*[The grey shaded text and question number 3 is only included in the screening treatment.]*

1. Assume your contract offer got rejected. What is your profit? What is the income of your employee?
2. Assume you want to enter a requested work effort of 7. What is the minimum wage you have to offer?
3. Assume you see the following table with information on your screen. *[Screen shows that the employer chose a work effort of 5 in the last and of 8 in the second to last period. For the third to last period it says “information not yet available.”]*
  - 3.1. What is the current period of the experiment?
  - 3.2. Which work effort did the employee chose in the first period of the experiment?
4. Assume your current employee chose an actual work effort of 8 in the last period, of 10 in the second to last period, and of 3 in the third to last period. Assume you offered a contract without limitation in choice possibilities with respect to work effort. The offered wage is 25, the requested work effort is 10. The employee accepts the contract offer.
  - 4.1. Your employee chooses an actual work effort of 10. What is your profit? What is the income of the employee?
  - 4.2. Your employee chooses an actual work effort of 5. What is your profit? What is the income of the employee?
  - 4.3. Your employee chooses an actual work effort of 1. What is your profit? What is the income of the employee?
5. Assume your current employee chose an actual work effort of 8 in the last period, of 10 in the second to last period, and of 3 in the third to last period. Assume you offered a contract with limitation in choice possibilities with respect to work effort. The offered wage is 25, the requested work effort is 10. The employee accepts the contract offer.
  - 5.1. Your employee chooses an actual work effort of 10. What is your profit? What is the income of the employee?
  - 5.2. Your employee chooses an actual work effort of 5. What is your profit? What is the income of the employee?
  - 5.3. Your employee chooses an actual work effort of 3. What is your profit? What is the income of the employee?

Please raise your hand when you have solved all the test questions. We will then come to your workplace and check your answers.

*[If a subject made a mistake, we explained the relevant part of the instructions again and asked the subject to try the question again. The experiment started only after all subjects had answered all questions correctly.]*

*[End of instructions for the employers.]*

*[Begin of instructions for the employees in the base and screening treatment.]*

### **General instructions for participants**

*[Same text as in instructions for employers.]*

### **The Experiment**

There are two types of participants in this experiment, employers and employees. The participants are equally distributed in these two roles. You play the role of an employee during the entire experiment. The experiment lasts for 15 periods. During each period, a random device assigns one of the employers to you. You will not learn of the identity of the persons assigned to you, neither during nor after the experiment. The other participants will also not be informed of your identity. This will guarantee the complete anonymity of the decisions. Here we will first give you a summary of the course of a period. More detailed information will follow on the next pages.

Each period of the experiment consists of two stages. During the first stage, your employer determines a labor contract which he offers to you. 1) Your employer can choose the type of labor contract which he offers to you. He can choose between (i) a contract without limitation of your choice possibilities with respect to the work effort and (ii) a contract with limitation of your choice possibilities with respect to the work effort. 2) Your employer then chooses the salary that he offers to you. 3) Finally, he selects the work effort that he requests from you. In the second stage you will be notified which contract the employer offers you. You can then react to this contract: 1) You can decide whether to accept or decline the contract. 2) If you accept the labor contract, you decide on the actual work effort. The period ends after the second stage. The employer's and the employee's decisions determine both your income as well

as the employer's profit in this period. There are a total of 15 periods. Your total income in this experiment is thus the sum of your income over the 15 periods; the employer's entire profit is the sum of his profit over the 15 periods.

### **Detailed information about the course of a period**

In each period, your employer chooses whether he will offer you a contract without limitation of your choice possibilities with respect to the work effort or a contract with limitation of your choice possibilities with respect to the work effort. The difference between the two contracts is that – provided you accept the contract – you must select a work effort of at least 3 in case of a contract with a limitation of your choice possibilities. In a contract without limitation of choice possibilities, you can also choose a work effort of 2 or the minimum work effort of 1. In addition to the decision on the type of contract, your employer must also determine the salary offered and the requested work effort. You are not bound to the requested work effort, however; you can – provided you accept the contract – also choose a greater or smaller work effort. In case of a contract with limitation of the choice possibilities with respect to work effort, however, you must at least choose a work effort of 3 – provided you accept the contract. If you accept the contract, your employer must pay the salary offered in any case, regardless of the actual work effort you choose. If you decline the contract, your employer pays you no salary and you cannot choose a work effort.

The following applies with respect to the requested and actual work effort: Your employer can choose any integer between 1 and 10 for the requested work effort. The lowest work effort is 1 and the highest is 10. It is not the requested work effort, however, but the actual work effort, that is decisive for determining the profit which your employer ultimately earns. In case of a contract without limitation of choice possibilities in work effort, you can also choose any integer value between 1 and 10 as your actual work effort. In case of a contract with limitation of choice possibilities in work effort, you can only choose any integer value between 3 and 10 as your actual work effort. You are thus forced to select a minimum work effort of 3. In case of a contract without limitation in choice possibilities with respect to work effort, your employer will earn 5 points for each actual unit of work effort. If, for example, the actual work effort is 1, he will earn  $5 \times 1 = 5$  points; if the actual work effort is 7, he will then receive  $5 \times 7 = 35$  points, etc. In case of a contract with limitation in choice possibilities with respect to work effort, your employer will earn 4 points for each actual unit of work effort. If, for example, the



actual work effort is 3 (the minimum for this contract), he will earn  $4 \times 3 = 12$  points; if the actual work effort is 7, he will earn  $4 \times 7 = 28$  points, etc.

Thus, there are two differences between the two types of contracts: 1) In case of a contract without limitation in choice possibilities with respect to work effort, you can select the minimum actual work effort of 1. In case of a contract with limitation in choice possibilities with respect to work effort, you must opt for a minimum actual work effort of 3. 2) In case of a contract without limitation in choice possibilities with respect to work effort, your employer earns 5 points per actual unit of work effort. In case of a contract with limitation in choice possibilities with respect to work effort, your employer earns 4 points per actual unit of work effort.

The actual work effort is associated with costs for you. Each unit of actual work effort costs you 1 point (independent of the type of contract). If you choose an actual work effort of 1, this costs you 1 point; if you choose an actual work effort of 2, this costs you 2 points, etc. Once your employer has made his decisions on the type of contract, the amount of the salary offered, and the requested work effort during the first stage of the experiment, his decisions will be notified to you. During the second stage, you must then decide whether to accept or to decline the offered contract. If you accept the labor contract, you must then decide on the actual work effort.

*[The following, grey shaded text is only included in the screening treatment.]*

Before you make your decisions in a period, a table is shown for your information. This table indicates your actual work effort in the last 3 periods. If you declined a contract, "contract declined" will appear instead of the actual work effort. The table presented to you will also be shown to your present employer, before he determines the labor contract. In each period, your employer at the time knows the actual work effort you selected in the last 3 periods. This also means that the work effort that you choose in the current period will be notified to your next employers. After your employer is shown the table, he determines the labor contract that he offers you. How the table is to be interpreted: The first line of the table (see picture) indicates the actual work effort you chose in the last period. The second line indicates the actual work effort in the second to last and the third line the actual work effort in the third to last period. If the contract was declined in a period, you will find the text "contract declined".

*[Screen shot showing the table.]*

The information in the table is incomplete in the first three periods of the experiment, as there are not enough previous periods. The text on this line states, "information not yet available". The information over the last three periods is first complete beginning in period 4.

Once you have made your decisions, an informational screen will appear. You will then be informed of your employer's decisions and you will once again see your own decisions. Furthermore, your income and your employer's profits for this period will also be shown. Following this, the next period begins. The experiment runs for a total of 15 periods. A new employer will be randomly assigned to you in every period. (If there are an odd number of participants in the experiment, it can happen that no employer will be assigned to you in one period.)

### **Calculation of income and profit at the end of each period**

Your income at the end of each period depends both on your decisions and those of your employer during the first stage. Your income at the end of the experiment is the sum of your income stemming from the 15 periods. You can be confronted with two possibilities at the end of each period: 1) You decline the contract. In this case, your employer does not have to pay the salary offered, and you cannot choose a work effort. Both your income and your employer's profits amount to 0 points in this period. 2) You accept the contract. In this case, your income in points depends on the salary offered and the actual work effort. The requested work effort does not play any role in the calculation of your income. Your income is then calculated as follows: Your income = salary offered – actual work effort. Your employer's profit in points depends on type of contract, the salary offered, and the actual work effort. The requested work effort does not play any role in the calculation of his profit. A) In case of a contract without limitation in the choice possibilities, the profit in a period is calculated as follows: Your employer's profit = 5 x actual work effort – salary offered. B) In case of a contract with limitation in the choice possibilities, the profit in a period is calculated as follows: Your employer's profit = 4 x actual work effort – salary offered. It is thus possible that an employer may incur a loss in individual periods if the actual work effort is relatively low and the salary is relatively high. Any losses will be offset with profits from other periods or with the initial endowment.

## Procedure on the computer

You enter your decision whether you accept the contract and the actual work effort in case of acceptance on the following computer screen:

*[Screen shown here; in the screening treatment it includes information about an agent's past effort choices.]*

*[The following, grey shaded text is only included in the screening treatment.]*

On the upper part of the screen, you will find the table with information on your actual work effort in the last 3 periods. (The example shown here is completely arbitrary.)

The middle of the screen shows the type of contract, the salary offered, and the requested work effort. (The contract offered to you in the experiment can vary from the example above, which is chose arbitrarily.) Underneath, you will find the buttons "Yes" and "No" next to the question "Do you accept the contract?" Click the corresponding button to make your decision. If you accept the contract, you must also select a work effort. Enter the pertinent number into the blue field. If you decline the contract, you cannot enter a work effort. When you have made your decisions, click the OK button. You can revise your decisions for as long as you have not pressed the OK button. Do you have any questions?

## Test questions:

*[The grey shaded text and question number 2 is only included in the screening treatment.]*

1. Assume you reject a contract offer. What is your income? What is the profit of your employer?
2. Assume you see the following table with information on your screen. *[Screen shows that the employer chose a work effort of 5 in the last and of 8 in the second to last period. For the third to last period it says "information not yet available."]*
  - 2.1. What is the current period of the experiment?
  - 2.2. Which work effort did you chose in the first period of the experiment?
  - 2.3. Assume you choose an actual work effort of 3 in the current period. Please complete the following table with information that would be shown to the employer who will be randomly matched with you in the next period. *[Screen with an empty table to be filled shown here.]*
3. Assume you have chosen an actual work effort of 8 in the last period, of 10 in the second to last period, and of 3 in the third to last period. Assume your employer offered a contract

without limitation in choice possibilities with respect to work effort. The offered wage is 25, the requested work effort is 10. You accept the contract offer.

3.1. You choose an actual work effort of 10. What is your income? What is the profit of your employer?

3.2. You choose an actual work effort of 5. What is your income? What is the profit of your employer?

3.3. You choose an actual work effort of 1. What is your income? What is the profit of your employer?

4. Assume you have chosen an actual work effort of 8 in the last period, of 10 in the second to last period, and of 3 in the third to last period. Assume your employer offered a contract with limitation in choice possibilities with respect to work effort. The offered wage is 25, the requested work effort is 10. You accept the contract offer.

4.1. You choose an actual work effort of 10. What is your income? What is the profit of your employer?

4.2. You choose an actual work effort of 5. What is your income? What is the profit of your employer?

4.3. You choose an actual work effort of 3. What is your income? What is the profit of your employer?

5. Assume you are in period 5 of the experiment and you accepted a contract without limitation in the choice possibilities with respect to work effort. In the period 3 you chose a work effort of 8, in period 4 of 7. Which information will be shown to your next employer if you choose a work effort of 1 in the current period? Please complete the following table with information that would be shown to the employer who will be randomly matched with you in the next period. *[Screen with an empty table to be filled shown here.]*

Please raise your hand when you have solved all the test questions. We will then come to your workplace and check your answers.

*[If a subject made a mistake, we explained the relevant part of the instructions again and asked the subject to try the question again. The experiment started only after all subjects had answered all questions correctly.]*

*[End of instructions for the employees.]*

The instructions in the competition treatment are basically equivalent to the instructions in the screening treatment. The difference is as follows. First, employers are informed that they receive information about past behavior not only from one but from four agents, and agents are informed that not only one but four employers will observe their current behavior in each future period. Second, employers are informed that they have to make a contract offer to each of the four agents, and agents are informed that they will receive four contract offers from each of the four employers. Finally, since the competition treatment lasted longer than the base and the screening treatments and since the participants played only 15 rounds (in the base and the screening treatment the respective other treatment was also played), the participants received a show-up fee of 20 CHF and the exchange rate was 10 points = 2.5 CHF.

The English translation of the additional section of the instructions in the competition treatment explaining the matching protocol is as follows:

*[Begin of the section explaining the matching procedure in the competition treatment.]*

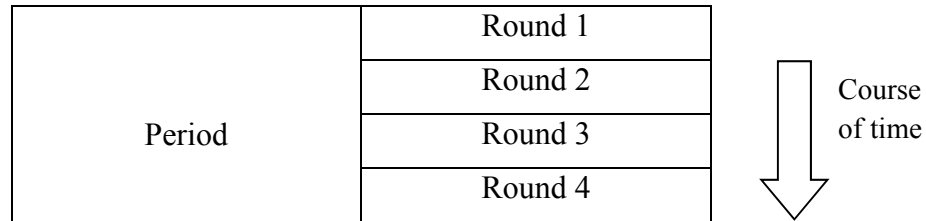
#### **The assignment of employers and employees in a period**

Four employers and four employees are assigned to a group in each period (see diagram 1). The groups are made anew by the computer each period using a random device. This means that you will be in a new group of employees and employers each period.

Employer 1	Employee 1
Employer 2	Employee 2
Employer 3	Employee 3
Employer 4	Employee 4

**Diagram 1:** Four employers and four employees are assigned to a group in each period.

Each employer is informed of the average amount of work each of the four employees in his group completed in the last three periods. Each employer can offer a contract to each of the four employees. Each employer must then determine the order in which his offers are presented to the four employees. The pairing of employers and employees takes place in rounds (see diagram 2). Each employer determines which employee will be offered his contract offer in round 1, which in round 2, which in round 3, and which in round 4.



**Diagram 2:** The pairing of employers and employees takes place over 4 rounds.

An individual employer can only make a specific employee one offer. E.g., it is not possible to make employee 3 an offer both in rounds 1 and 2. Furthermore, an individual employer can only make one offer per round. It is not possible, e.g., for an employer to offer a contract to both employee 2 and to employee 4 in round 1. An employer thus makes each of the four employees one offer in exactly one round. An employee, however, can receive several offers (from various employers). It is also possible for an employee not to receive an offer in a round.

Even though each employer offers a total of four labor contracts, only one of these contracts can be accepted. As soon as an employer's contract is accepted in a round, all of this employer's offers that should have been made in the later rounds lose their validity and will no longer be shown to the employees. In the same way, an employee can accept a maximum of one contract offer. (Each employee receives at least one offer, but may receive up to four offers in the course of the four rounds.) If an employee accepts a contract offer in one round, he will not receive any further offers in the subsequent rounds. Any contracts that the employee would have received from other employers automatically lose their validity and will no longer be shown. If an employee receives several contract offers in one round (from various employers), he can only accept one of these offers.

It is thus neither possible for an employer to conclude contracts with several employees nor for an employee to conclude contracts with several employers. Each participant can thus enter into a maximum of one contractual relationship. It is possible, however, that an employer or an employee is not able to conclude a contract. This occurs with an employee if he rejects all contractual offers. This is the case for an employer if all employees reject his offers or have already accepted contractual offers from other employers. After the completion of four rounds, those employees with a contract choose their actual work effort. All employers and employees will then be informed of their profits or earnings in the corresponding period. Following this, the next period begins.

*[End of the section.]*

In the following we present the original German instructions for the base and the screening treatment. We also include the additional section explaining the matching protocol in the competition treatment.

*[Begin of the German instructions for the employers in the base and screening treatment.]*

### **Allgemeine Erklärungen für die Teilnehmer**

Wir begrüßen Sie ganz herzlich zu diesem wirtschaftswissenschaftlichen Experiment. Wenn Sie die nachfolgenden Erklärungen genau lesen, dann können Sie – je nach Ihren Entscheidungen und den Entscheidungen der anderen Teilnehmer – zusätzlich zu den 10 Franken, die Sie als Startgeld für Ihre Teilnahme erhalten, Geld verdienen. Es ist daher sehr wichtig, dass Sie diese Erklärungen genau durchlesen. Wenn Sie Fragen haben, dann richten Sie diese bitte an uns. Während des Experiments ist es Ihnen nicht erlaubt, mit den anderen Teilnehmern am Experiment zu sprechen. Die Nichtbeachtung dieser Regel führt zum Ausschluss aus dem Experiment und allen Zahlungen. Während des Experiments sprechen wir nicht von Franken, sondern von Punkten. Ihr gesamtes Einkommen wird also zunächst in Punkten berechnet. Die von Ihnen während des Experiments erzielte Gesamtpunktezah wird dann am Ende in Franken umgerechnet, wobei gilt 10 Punkte = 1,25 Franken. Am Ende der heutigen Sitzung bekommen Sie von uns die während des Experiments verdiente Punktezah plus 10 Franken für das Erscheinen bar ausbezahlt. Auf den nächsten Seiten beschreiben wir den genauen Ablauf des Experiments.

### **Das Experiment**

In diesem Experiment gibt es zwei Arten von Teilnehmern, Arbeitgeber und Arbeitnehmer. Alle Teilnehmer sind gleichmäßig auf diese beiden Rollen aufgeteilt. Sie sind während des gesamten Experiments in der Rolle eines Arbeitgebers. Das Experiment läuft über 15 Perioden. In jeder Periode wird Ihnen per Zufallsentscheid einer der Arbeitnehmer neu zugeteilt. Weder während noch nach dem Experiment erfahren Sie die Identität der zugeteilten Personen. Diese erfahren ebenfalls nichts über Ihre Identität. Dadurch wird die volle Anonymität der Entscheidungen gewährleistet. Im Folgenden geben wir Ihnen zunächst einen Überblick über den Ablauf einer Periode. Detaillierte Informationen finden Sie auf den nächsten Seiten.

Jede Periode des Experiments besteht aus zwei Stufen. Auf der ersten Stufe legen Sie als Arbeitgeber einen Arbeitsvertrag fest, den Sie Ihrem Arbeitnehmer anbieten: 1) Sie wählen die

Art des Arbeitsvertrages, den Sie Ihrem Arbeitnehmer anbieten. Sie können zwischen einem (i) Vertrag ohne Einschränkung der Wahlmöglichkeit des Arbeitnehmers bei der Arbeitsmenge und einem (ii) Vertrag mit Einschränkung der Wahlmöglichkeit des Arbeitnehmers bei der Arbeitsmenge wählen. 2) Dann wählen Sie den Lohn, den Sie dem Arbeitnehmer anbieten wollen. 3) Anschliessend wählen Sie die gewünschte Arbeitsmenge.

Ihre Entscheidungen auf der ersten Stufe werden Ihrem Arbeitnehmer mitgeteilt. Der Arbeitnehmer kann dann auf der zweiten Stufe auf den angebotenen Vertrag reagieren: 1) Er entscheidet, ob er den angebotenen Arbeitsvertrag annimmt oder ablehnt. 2) Falls er den Arbeitsvertrag annimmt, entscheidet er über die tatsächliche Arbeitsmenge. Je grösser die tatsächliche Arbeitsmenge, desto grösser ist Ihr Gewinn. Dem Arbeitnehmer entstehen aus der tatsächlich gewählten Arbeitsmenge allerdings Kosten, die umso höher sind, je höher die tatsächliche Arbeitsmenge. Nach der zweiten Stufe ist eine Periode beendet. Die Entscheidungen von Arbeitgeber und Arbeitnehmer bestimmen sowohl Ihren Gewinn wie auch das Einkommen des Arbeitnehmers in dieser Periode. Insgesamt gibt es 15 Perioden. Ihr Gesamtgewinn in diesem Experiment ist daher die Summe Ihrer Gewinne in den 15 Perioden. Das Gesamteinkommen eines Arbeitnehmers ist die Summe seiner Einkommen in den 15 Perioden.

### **Detaillierte Informationen über den Ablauf einer Periode**

In jeder Periode wählen Sie die Art des Arbeitsvertrages, den Sie anbieten möchten: Sie können sich zwischen einem Vertrag ohne Einschränkung der Wahlmöglichkeit bei der Arbeitsmenge und einem Vertrag mit Einschränkung der Wahlmöglichkeit bei der Arbeitsmenge entscheiden. Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit ist Ihr Arbeitnehmer – sofern er den Vertrag annimmt – gezwungen, mindestens eine Arbeitsmenge von 3 zu wählen. Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit kann Ihr Arbeitnehmer auch eine Arbeitsmenge von 2 oder die minimale Arbeitsmenge von 1 wählen. Neben der Entscheidung über die Art des Vertrages, müssen Sie in jeder Periode den angebotenen Lohn und die gewünschte Arbeitsmenge festlegen. Ihr Arbeitnehmer ist nicht an die gewünschte Arbeitsmenge gebunden. Er kann auch eine höhere oder niedrigere Arbeitsmenge wählen. Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit bei der Arbeitsmenge muss Ihr Arbeitnehmer jedoch – sofern er den Vertrag annimmt – mindestens eine Arbeitsmenge von 3 wählen. Wenn der Arbeitnehmer den Vertrag annimmt, dann müssen Sie den angebotenen Lohn in jedem Fall zahlen, unabhängig von der tatsächlichen Arbeitsmenge des Arbeitnehmers.



Bezüglich der gewünschten und der tatsächlichen Arbeitsmenge gilt folgendes: Sie können als gewünschte Arbeitsmenge jeden ganzzahligen Wert zwischen 1 und 10 wählen. Die niedrigste Arbeitsmenge ist 1 und die höchste ist 10. Für den Gewinn, den Sie letztlich erzielen, ist nicht die gewünschte Arbeitsmenge, sondern die tatsächliche Arbeitsmenge entscheidend. Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit bei der Arbeitsmenge kann Ihr Arbeitnehmer als tatsächliche Arbeitsmenge ebenfalls jeden ganzzahligen Wert zwischen 1 und 10 wählen. Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit bei der Arbeitsmenge kann Ihr Arbeitnehmer als tatsächliche Arbeitsmenge nur einen ganzzahligen Wert zwischen 3 und 10 wählen. Ihr Arbeitnehmer ist also gezwungen, mindestens eine Arbeitsmenge von 3 zu wählen. Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit bei der Arbeitsmenge verdienen Sie pro Einheit der tatsächlichen Arbeitsmenge 5 Punkte. Wenn die tatsächliche Arbeitsmenge beispielsweise 1 ist, dann verdienen Sie  $5 \times 1 = 5$  Punkte, wenn die tatsächliche Arbeitsmenge beispielsweise 7 ist, dann verdienen Sie  $5 \times 7 = 35$  Punkte, usw. Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit bei der Arbeitsmenge verdienen Sie pro Einheit der tatsächlichen Arbeitsmenge 4 Punkte. Wenn die tatsächliche Arbeitsmenge beispielsweise 3 ist (das Minimum bei diesem Vertrag), dann verdienen Sie  $4 \times 3 = 12$  Punkte, wenn die tatsächliche Arbeitsmenge beispielsweise 7 ist, dann verdienen Sie  $4 \times 7 = 28$  Punkte, usw.

Es gibt also zwei Unterschiede zwischen den beiden Arten von Verträgen. 1) Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit kann Ihr Arbeitnehmer die minimale tatsächliche Arbeitsmenge von 1 wählen. Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit ist Ihr Arbeitnehmer gezwungen, mindestens eine tatsächliche Arbeitsmenge von 3 zu wählen. 2) Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit verdienen Sie 5 Punkte pro tatsächliche Arbeitsmenge. Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit verdienen Sie 4 Punkte pro tatsächliche Arbeitsmenge.

Für Ihren Arbeitnehmer ist die tatsächliche Arbeitsmenge mit Kosten verbunden. Jede Einheit der tatsächlichen Arbeitsmenge kostet Ihren Arbeitnehmer 1 Punkt (unabhängig von der Art des Vertrages). Wenn die tatsächliche Arbeitsmenge 1 ist, dann kostet dies Ihren Arbeitnehmer 1 Punkt, wenn die tatsächliche Arbeitsmenge 2 ist, dann kostet dies Ihren Arbeitnehmer 2 Punkte, usw. Bezüglich des angebotenen Lohns gilt folgendes: Der angebotene Lohn muss die Kosten der gewünschten Arbeitsmenge abdecken. Wenn Sie beispielsweise eine Arbeitsmenge von 5 wünschen, dann muss der angebotene Lohn mindestens 5 betragen.

*[The following, grey shaded text is only included in the screening treatment.]*

Bevor Sie Ihre Entscheidungen in einer Periode treffen, wird Ihnen zu Ihrer Information eine Tabelle angezeigt. In dieser Tabelle ist angegeben, welche tatsächliche Arbeitsmenge Ihr momentaner Arbeitnehmer in den letzten 3 Perioden jeweils gewählt hat. Hat der Arbeitnehmer einen Vertrag abgelehnt, so steht an der entsprechenden Stelle „Vertrag abgelehnt“ anstatt der tatsächlichen Arbeitsmenge. Sie erhalten in jeder Periode eine neue Tabelle, da Ihnen in jeder Periode einer der Arbeitnehmer neu zugewiesen wird. Ihr jeweiliger Arbeitnehmer weiss auch, dass Sie als Arbeitgeber seine Wahl der tatsächlichen Arbeitsmenge in den letzten 3 Perioden kennen. Wie die Tabelle zu verstehen ist: In der ersten Zeile der Tabelle (siehe Abbildung) steht die tatsächliche Arbeitsmenge ihres momentanen Arbeitnehmers in der letzten Periode. In der zweiten Zeile die tatsächliche Arbeitsmenge der vorletzten und in der dritten Zeile die tatsächliche Arbeitsmenge in der drittletzten Periode. Wurde in einer Periode der Vertrag abgelehnt, so finden Sie dort den Eintrag „Vertrag abgelehnt“.

*[Screen shot showing the table.]*

In den ersten drei Perioden des Experiments sind die Angaben in der Tabelle noch unvollständig, da es noch nicht genügend Vorperioden gibt. Der jeweilige Eintrag lautet dann „Angabe liegt noch nicht vor“. Erst ab Periode 4 liegen die Informationen über die letzten drei Perioden vollständig vor.

Wenn Sie auf der ersten Stufe Ihre Entscheidungen über die Art des Vertrages, die Höhe des angebotenen Lohns und die gewünschte Arbeitsmenge getroffen haben, dann werden Ihre Entscheidungen Ihrem Arbeitnehmer mitgeteilt. Der Arbeitnehmer kann dann auf der zweiten Stufe entscheiden, ob er den angebotenen Arbeitsvertrag annimmt oder ablehnt. Falls er den Arbeitsvertrag annimmt, entscheidet er über die tatsächliche Arbeitsmenge. Sobald Ihr Arbeitnehmer seine Entscheidungen getroffen hat, wird Ihnen ein Informationsbildschirm angezeigt. Dort erfahren Sie die Entscheidungen Ihres Arbeitnehmers, und Sie sehen auch nochmals Ihre eigenen Entscheidungen. Darüber hinaus werden Ihnen Ihr Gewinn und das Einkommen Ihres Arbeitnehmers in dieser Periode angezeigt. Danach beginnt die nächste Periode. Das Experiment läuft insgesamt über 15 Perioden. In jeder Periode wird Ihnen per Zufallsentscheid einer der Arbeitnehmer neu zugeteilt. (Sollte die Anzahl der Teilnehmer am Experiment ungerade sein, so kann es vorkommen, dass Ihnen in einer Periode einmal kein Arbeitnehmer zugeteilt wird.)

## Die Gewinn- und Einkommensberechnung am Ende jeder Periode

Ihr Gewinn am Ende jeder Periode hängt sowohl von Ihren Entscheidungen, wie auch von den Entscheidungen Ihres Arbeitnehmers auf der zweiten Stufe ab. Ihr Gewinn am Ende des Experiments ist die Summe der Gewinne aus den 15 Perioden. Es gibt zwei Möglichkeiten, denen Sie am Ende jeder Periode gegenüberstehen können: 1) Ihr Arbeitnehmer lehnt den Vertrag ab. In diesem Fall müssen Sie den angebotenen Lohn nicht zahlen. Ihr Arbeitnehmer kann auch keine Arbeitsmenge wählen. Ihr Gewinn und das Einkommen Ihres Arbeitnehmers in dieser Periode sind somit jeweils 0 Punkte. 2) Ihr Arbeitnehmer nimmt den Vertrag an. In diesem Fall hängt Ihr Gewinn in Punkten in dieser Periode von der Art des Vertrages, dem angebotenen Lohn und der tatsächlichen Arbeitsmenge ab. Die gewünschte Arbeitsmenge spielt bei der Berechnung Ihres Gewinns keine Rolle. A) Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit kann die tatsächliche Arbeitsmenge von Ihrem Arbeitnehmer zwischen 1 und 10 gewählt werden. Ihr Gewinn berechnet sich dann wie folgt: Ihr Gewinn =  $5 \times \text{tatsächliche Arbeitsmenge} - \text{angebotener Lohn}$ . B) Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit muss die tatsächliche Arbeitsmenge von Ihrem Arbeitnehmer zwischen 3 und 10 gewählt werden. Ihr Gewinn berechnet sich dann wie folgt: Ihr Gewinn =  $4 \times \text{tatsächliche Arbeitsmenge} - \text{angebotener Lohn}$ . Es kann also passieren, dass in einzelnen Perioden ein Verlust auftritt, wenn die tatsächliche Arbeitsmenge relativ gering und der Lohn relativ hoch ist. Diese Verluste werden mit den Gewinnen aus anderen Perioden oder mit dem Startgeld verrechnet. Bei Annahme des Vertrags hängt das Einkommen Ihres Arbeitnehmers in Punkten vom angebotenen Lohn und der tatsächlichen Arbeitsmenge ab. Das Einkommen eines Arbeitnehmers in einer Periode berechnet sich wie folgt: Einkommen des Arbeitnehmers =  $\text{angebotener Lohn} - \text{tatsächliche Arbeitsmenge}$ .

## Ablauf am Computer

Ihre Entscheidung über die Art des Vertrages, den angebotenen Lohn und die gewünschte Arbeitsmenge geben Sie in dem folgenden Computerbildschirm ein:

*[Screen shown here; in the screening treatment it includes information about an agent's past effort choices.]*

*[The following, grey shaded text is only included in the screening treatment.]*

Im oberen Teil des Bildschirms finden Sie die Tabelle mit den Angaben über die tatsächliche Arbeitsmenge Ihres momentanen Arbeitnehmers in den letzten 3 Perioden. (Das Beispiel ist rein

willkürlich gewählt.)

In der Mitte des Bildschirms sehen Sie die beiden Knöpfe „Vertrag ohne Einschränkung der Wahlmöglichkeit“ bzw. „Vertrag mit Einschränkung der Wahlmöglichkeit“. Für Ihre Entscheidung klicken Sie den entsprechenden Knopf an. Dann legen Sie den angebotenen Lohn fest. Sie geben dazu die entsprechende Zahl in das obere blaue Feld ein. Schliesslich legen Sie die gewünschte Arbeitsmenge fest. Dazu geben Sie die entsprechende Zahl in das untere blaue Feld ein. Der angebotene Lohn muss mindestens die Kosten der gewünschten Arbeitsmenge abdecken. Wenn Sie Ihre Entscheidungen getroffen haben, drücken Sie den OK-Knopf. Solange dieser Knopf nicht gedrückt wurde, können Sie Ihre Entscheidungen noch revidieren. Haben Sie noch Fragen?

### Übungsaufgaben

*[The grey shaded text and question number 3 is only included in the screening treatment.]*

1. Angenommen Ihr Vertragsangebot wurde abgelehnt. Wie hoch ist Ihr Gewinn? Wie hoch ist das Einkommen Ihres Arbeitnehmers?
2. Angenommen Sie wollen eine gewünschte Arbeitsmenge von 7 festlegen. Wie lautet der Mindestlohn, den Sie anbieten müssen?
3. Angenommen Sie sehen folgende Informationstabelle auf Ihrem Bildschirm. *[Screen shows that the employer chose a work effort of 5 in the last and of 8 in the second to last period. For the third to last period it says “information not yet available.”]*
  - 3.1. In welcher Periode des Experiments befinden Sie sich?
  - 3.2. Welche tatsächliche Arbeitsmenge hat Ihr Arbeitnehmer in der ersten Periode des Experiments gewählt?
4. Angenommen Ihr momentaner Arbeitnehmer hat in der letzten Periode eine tatsächliche Arbeitsmenge von 8, in der vorletzten Periode von 10 und in der drittletzten Periode von 3 gewählt. Sie bieten einen Vertrag ohne Einschränkung bei der Wahlmöglichkeit der Arbeitsmenge an. Der angebotene Lohn beträgt 25, die gewünschte Arbeitsmenge beträgt 10. Ihr Arbeitnehmer nimmt den Vertrag an.
  - 4.1. Ihr Arbeitnehmer wählt eine tatsächliche Arbeitsmenge von 10. Wie hoch ist Ihr Gewinn? Wie hoch ist das Einkommen Ihres Arbeitnehmers?
  - 4.2. Ihr Arbeitnehmer wählt eine tatsächliche Arbeitsmenge von 5. Wie hoch ist Ihr Gewinn? Wie hoch ist das Einkommen Ihres Arbeitnehmers?

4.3. Ihr Arbeitnehmer wählt eine tatsächliche Arbeitsmenge von 1. Wie hoch ist Ihr Gewinn?  
Wie hoch ist das Einkommen Ihres Arbeitnehmers?

5. Angenommen Ihr momentaner Arbeitnehmer hat in der letzten Periode eine tatsächliche Arbeitsmenge von 8, in der vorletzten Periode von 10 und in der drittletzten Periode von 3 gewählt. Sie bieten einen Vertrag mit Einschränkung bei der Wahlmöglichkeit der Arbeitsmenge an. Der angebotene Lohn beträgt 25, die gewünschte Arbeitsmenge beträgt 10. Ihr Arbeitnehmer nimmt den Vertrag an.

5.1. Ihr Arbeitnehmer wählt eine tatsächliche Arbeitsmenge von 10. Wie hoch ist Ihr Gewinn? Wie hoch ist das Einkommen Ihres Arbeitnehmers?

5.2. Ihr Arbeitnehmer wählt eine tatsächliche Arbeitsmenge von 5. Wie hoch ist Ihr Gewinn? Wie hoch ist das Einkommen Ihres Arbeitnehmers?

5.3. Ihr Arbeitnehmer wählt eine tatsächliche Arbeitsmenge von 3. Wie hoch ist Ihr Gewinn? Wie hoch ist das Einkommen Ihres Arbeitnehmers?

Wenn Sie alle Aufgaben gelöst haben, strecken Sie bitte auf. Wir kommen dann zu Ihnen und überprüfen Ihre Antworten. Wenn wir Ihre Antworten kontrolliert haben, dann ist es sinnvoll, wenn Sie über Ihre Entscheidungen im Experiment schon einmal gründlich nachdenken.

*[End of instructions for the employers.]*

*[Begin of instructions for the employees in the base and screening treatment.]*

### **Allgemeine Erklärungen für die Teilnehmer**

*[Same text as in instructions for employers.]*

### **Das Experiment**

In diesem Experiment gibt es zwei Arten von Teilnehmern, Arbeitgeber und Arbeitnehmer. Alle Teilnehmer sind gleichmäßig auf diese beiden Rollen aufgeteilt. Sie sind während des gesamten Experiments in der Rolle eines Arbeitnehmers. Das Experiment läuft über 15 Perioden. In jeder Periode wird Ihnen per Zufallsentscheid einer der Arbeitgeber neu zugeteilt. Weder während noch nach dem Experiment erfahren Sie die Identität der zugeteilten Personen. Diese erfahren ebenfalls nichts über Ihre Identität. Dadurch wird die volle Anonymität der Entscheidungen

gewährleistet. Im Folgenden geben wir Ihnen zunächst einen Überblick über den Ablauf einer Periode. Detaillierte Informationen finden Sie auf den nächsten Seiten.

Jede Periode des Experiments besteht aus zwei Stufen. Auf der ersten Stufe legt Ihr Arbeitgeber den Arbeitsvertrag fest, den er Ihnen als Arbeitnehmer anbietet: 1) Ihr Arbeitgeber wählt zunächst die Art des Arbeitsvertrages, den er Ihnen anbietet. Er kann einen (i) Vertrag ohne Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge oder einen (ii) Vertrag mit Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge vorschlagen. 2) Dann wählt Ihr Arbeitgeber den Lohn, den er Ihnen anbietet. 3) Schliesslich wählt er auch noch die Arbeitsmenge, die er sich von Ihnen wünscht. Auf der zweiten Stufe erfahren Sie, welchen Vertrag der Arbeitgeber Ihnen anbietet. Sie können dann auf diesen Vertrag reagieren: 1) Sie entscheiden, ob Sie den Arbeitsvertrag annehmen oder ablehnen. 2) Falls Sie den Arbeitsvertrag annehmen, entscheiden Sie über die tatsächliche Arbeitsmenge. Nach der zweiten Stufe ist eine Periode beendet. Die Entscheidungen von Arbeitgeber und Arbeitnehmer bestimmen sowohl Ihr Einkommen wie auch den Gewinn Ihres Arbeitgebers in dieser Periode. Insgesamt gibt es 15 Perioden. Ihr Gesamteinkommen in diesem Experiment ist daher die Summe Ihrer Einkommen in den 15 Perioden. Der Gesamtgewinn eines Arbeitgebers ist die Summe seiner Gewinne in den 15 Perioden.

### **Detaillierte Informationen über den Ablauf einer Periode**

In jeder Periode entscheidet sich Ihr jeweiliger Arbeitgeber ob er Ihnen einem Vertrag ohne Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge oder einem Vertrag mit Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge anbietet. Der Unterschied zwischen den beiden Verträgen besteht darin, dass Sie – sofern Sie den Vertrag annehmen – bei einem Vertrag mit Einschränkung Ihrer Wahlmöglichkeit gezwungen sind, mindestens eine Arbeitsmenge von 3 zu wählen. Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit können Sie auch eine Arbeitsmenge von 2 oder die minimale Arbeitsmenge von 1 wählen. Neben der Entscheidung über die Art des Vertrages, muss Ihr Arbeitgeber den angebotenen Lohn und die gewünschte Arbeitsmenge festlegen. Sie sind jedoch nicht an die gewünschte Arbeitsmenge gebunden. Sie können – sofern Sie den Vertrag annehmen – auch eine höhere oder niedrigere Arbeitsmenge wählen. Bei einem Vertrag mit Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge müssen Sie jedoch – sofern Sie den Vertrag annehmen – mindestens eine Arbeitsmenge von 3 wählen. Wenn Sie den Vertrag annehmen, dann muss Ihnen Ihr Arbeitgeber

den angebotenen Lohn in jedem Fall zahlen, unabhängig von der Arbeitsmenge, die Sie wählen. Wenn Sie den Vertrag ablehnen, dann zahlt Ihnen Ihr Arbeitgeber keinen Lohn. Sie können dann auch keine Arbeitsmenge wählen.

Bezüglich der gewünschten und tatsächlichen Arbeitsmenge gilt folgendes: Ihr Arbeitgeber kann als gewünschte Arbeitsmenge jeden ganzzahligen Wert zwischen 1 und 10 wählen. Die niedrigste Arbeitsmenge ist 1 und die höchste ist 10. Für den Gewinn, den Ihr Arbeitgeber erzielt, ist jedoch nicht die gewünschte Arbeitsmenge, sondern die tatsächliche Arbeitsmenge entscheidend. Bei einem Vertrag ohne Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge können Sie als tatsächliche Arbeitsmenge ebenfalls jeden ganzzahligen Wert zwischen 1 und 10 wählen. Bei einem Vertrag mit Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge können Sie die tatsächliche Arbeitsmenge nur zwischen 3 und 10 wählen. Sie sind also gezwungen, mindestens eine Arbeitsmenge von 3 zu wählen. Bei einem Vertrag ohne Einschränkung Ihrer Wahlmöglichkeit verdient Ihr Arbeitgeber pro Einheit der tatsächlichen Arbeitsmenge 5 Punkte. Wenn die tatsächliche Arbeitsmenge beispielsweise 1 ist, dann verdient er  $5 \times 1 = 5$  Punkte, wenn die tatsächliche Arbeitsmenge beispielsweise 7 ist, dann verdient er  $5 \times 7 = 35$  Punkte, usw. Bei einem Vertrag mit Einschränkung Ihrer Wahlmöglichkeit verdient Ihr Arbeitgeber pro Einheit der tatsächlichen Arbeitsmenge 4 Punkte. Wenn die tatsächliche Arbeitsmenge beispielsweise 3 ist (das Minimum bei diesem Vertrag), dann verdient er  $4 \times 3 = 12$  Punkte, wenn die tatsächliche Arbeitsmenge beispielsweise 7 ist, dann verdient er  $4 \times 7 = 28$  Punkte, usw.

Es gibt also zwei Unterschiede zwischen den beiden Arten von Verträgen. 1) Bei einem Vertrag ohne Einschränkung Ihrer Wahlmöglichkeit können Sie die minimale tatsächliche Arbeitsmenge von 1 wählen. Bei einem Vertrag mit Einschränkung Ihrer Wahlmöglichkeit sind Sie gezwungen, mindestens eine tatsächliche Arbeitsmenge von 3 zu wählen. 2) Bei einem Vertrag ohne Einschränkung Ihrer Wahlmöglichkeit verdient Ihr Arbeitgeber 5 Punkte pro tatsächliche Arbeitsmenge. Bei einem Vertrag mit Einschränkung Ihrer Wahlmöglichkeit verdient Ihr Arbeitgeber 4 Punkte pro tatsächliche Arbeitsmenge.

Für Sie ist die tatsächliche Arbeitsmenge mit Kosten verbunden. Jede Einheit tatsächliche Arbeitsmenge kostet Sie 1 Punkt (unabhängig von der Art des Vertrages). Wenn Sie die tatsächliche Arbeitsmenge 1 wählen, dann kostet Sie dies 1 Punkt, wenn Sie die tatsächliche Arbeitsmenge 2 wählen, dann kostet Sie dies 2 Punkte, usw. Wenn Ihr Arbeitgeber auf der ersten

Stufe seine Entscheidungen über die Art des Vertrages, die Höhe des angebotenen Lohns und die gewünschte Arbeitsmenge getroffen hat, dann werden diese Ihnen mitgeteilt. Sie müssen dann auf der zweiten Stufe entscheiden, ob Sie den Vertrag annehmen oder ablehnen möchten. Wenn Sie den Arbeitsvertrag annehmen, müssen Sie über Ihre tatsächliche Arbeitsmenge entscheiden.

*[The following, grey shaded text is only included in the screening treatment.]*

Bevor Sie Ihre Entscheidungen in einer Periode treffen, wird Ihnen zu Ihrer Information eine Tabelle angezeigt. In dieser Tabelle ist Ihre tatsächliche Arbeitsmenge in den letzten 3 Perioden angegeben. Haben Sie einen Vertrag abgelehnt, so steht an der entsprechenden Stelle „Vertrag abgelehnt“ anstatt der tatsächlichen Arbeitsmenge. Dieselbe Tabelle, die Ihnen angezeigt wird, wird auch Ihrem jeweiligen Arbeitgeber angezeigt bevor dieser den Arbeitsvertrag festlegt. In jeder Periode erfährt also Ihr jeweiliger Arbeitgeber, welche tatsächliche Arbeitsmenge Sie in den letzten 3 Perioden jeweils gewählt haben. Das bedeutet auch, dass die Arbeitsmenge, welche Sie in der laufenden Periode wählen, Ihren nächsten Arbeitgebern bekannt sein wird. Nachdem Ihrem Arbeitgeber die Tabelle angezeigt wurde, legt er den Arbeitsvertrag fest, den er Ihnen anbietet. Wie die Tabelle zu verstehen ist: In der ersten Zeile der Tabelle (siehe Abbildung) steht die tatsächliche Arbeitsmenge, die Sie in der letzten Periode gewählt haben. In der zweiten Zeile die tatsächliche Arbeitsmenge der vorletzten und in der dritten Zeile die tatsächliche Arbeitsmenge in der drittletzten Periode. Haben Sie in einer Periode Ihren Vertrag abgelehnt, so finden Sie den Eintrag „Vertrag abgelehnt“.

*[Screen shot showing the table.]*

In den ersten drei Perioden des Experiments sind die Angaben in der Tabelle noch unvollständig, da es noch nicht genügend Vorperioden gibt. Der jeweilige Eintrag lautet dann „Angabe liegt noch nicht vor“. Erst ab Periode 4 liegen die Informationen über die letzten drei Perioden vollständig vor.

Sobald Sie Ihre Entscheidungen getroffen haben, wird Ihnen ein Informationsbildschirm angezeigt. Dort erfahren Sie nochmals die Entscheidungen Ihres Arbeitgebers und Ihre eigenen Entscheidungen. Darüber hinaus werden Ihnen Ihr Einkommen und der Gewinn Ihres Arbeitgebers in dieser Periode angezeigt. Danach beginnt die nächste Periode. Das Experiment läuft insgesamt über 15 Perioden. In jeder Periode wird Ihnen per Zufallsentscheid einer der Arbeitgeber neu zugeteilt. (Sollte die Anzahl der Teilnehmer am Experiment ungerade sein, so kann es vorkommen, dass Ihnen in einer Periode einmal kein Arbeitgeber zugeteilt wird.)



## Die Einkommens- und Gewinnberechnung am Ende jeder Periode

Ihr Einkommen am Ende jeder Periode hängt sowohl von Ihren Entscheidungen, wie auch von den Entscheidungen Ihres Arbeitgebers auf der ersten Stufe ab. Ihr Einkommen am Ende des Experiments ist die Summe Ihrer Einkommen aus den 15 Perioden. Es gibt zwei Möglichkeiten, denen Sie am Ende jeder Periode gegenüberstehen können: 1) Sie lehnen den Vertrag ab. In diesem Fall muss Ihr Arbeitgeber den angebotenen Lohn nicht zahlen. Sie können auch keine Arbeitsmenge wählen. Ihr Einkommen und der Gewinn Ihres Arbeitgebers in dieser Periode sind somit jeweils 0 Punkte. 2) Sie nehmen den Vertrag an. In diesem Fall hängt Ihr Einkommen in Punkten in dieser Periode vom angebotenen Lohn und der tatsächlichen Arbeitsmenge ab. Die gewünschte Arbeitsmenge hat keinen Einfluss auf Ihr Einkommen. Ihr Einkommen berechnet sich wie folgt: Ihr Einkommen = angebotener Lohn – tatsächliche Arbeitsmenge. Der Gewinn Ihres Arbeitgebers in Punkten hängt von der Art des Vertrages, dem angebotenen Lohn und der tatsächlichen Arbeitsmenge ab. Die gewünschte Arbeitsmenge spielt bei der Berechnung des Gewinns keine Rolle. A) Bei einem Vertrag ohne Einschränkung der Wahlmöglichkeit berechnet sich der Gewinn in einer Periode wie folgt: Gewinn Ihres Arbeitgebers = 5 x tatsächliche Arbeitsmenge – angebotener Lohn. B) Bei einem Vertrag mit Einschränkung der Wahlmöglichkeit berechnet sich der Gewinn in einer Periode wie folgt: Gewinn Ihres Arbeitgebers = 4 x tatsächliche Arbeitsmenge – angebotener Lohn. Es kann also passieren, dass ein Arbeitgeber in einzelnen Perioden einen Verlust macht, wenn die tatsächliche Arbeitsmenge relativ gering und der Lohn relativ hoch ist. Der Arbeitgeber muss diesen Verlust aus den Gewinnen anderer Perioden oder aus seinem Startgeld begleichen.

## Ablauf am Computer

Ihre Entscheidung, ob Sie den Vertrag annehmen oder ablehnen und die Wahl Ihrer tatsächlichen Arbeitsmenge im Falle einer Annahme geben Sie in dem folgenden Computerbildschirm ein:

*[Screen shown here; in the screening treatment it includes information about an agent's past effort choices.]*

*[The following, grey shaded text is only included in the screening treatment.]*

Im oberen Teil des Bildschirms finden Sie die Tabelle mit den Angaben über Ihre tatsächliche Arbeitsmenge in den letzten 3 Perioden. (Das Beispiel ist rein willkürlich gewählt.)

In der Mitte des Bildschirms sehen Sie die Art des Vertrages, den angebotenen Lohn und die gewünschte Arbeitsmenge. (Der Vertrag, der Ihnen im Experiment angeboten wird, kann vom

obigen, willkürlich gewählten Beispiel abweichen.) Darunter finden Sie rechts neben der Frage „Nehmen Sie den Vertrag an?“ die beiden Knöpfe „Ja“ bzw. „Nein“. Für Ihre Entscheidung klicken Sie den jeweiligen Knopf an. Falls Sie den Vertrag annehmen, so müssen Sie eine Arbeitsmenge wählen. Dazu geben Sie die entsprechende Zahl in das blaue Feld ein. Falls Sie den Vertrag ablehnen, so können Sie keine Arbeitsmenge eingeben. Wenn Sie Ihre Entscheidungen getroffen haben, drücken Sie den OK-Knopf. Solange dieser Knopf nicht gedrückt wurde, können Sie Ihre Entscheidungen noch revidieren. Haben Sie noch Fragen?

## Übungsaufgaben

*[The grey shaded text and questions number 2 and 5 are only included in the screening treatment.]*

1. Angenommen Sie lehnen das Vertragsangebot ab. Wie hoch ist Ihr Einkommen? Wie hoch ist der Gewinn Ihres Arbeitgebers?
2. Angenommen Sie sehen folgende Informationstabelle auf Ihrem Bildschirm. *[Screen shows that the employer chose a work effort of 5 in the last and of 8 in the second to last period. For the third to last period it says “information not yet available.”]*
  - 2.1. In welcher Periode des Experiments befinden Sie sich?
  - 2.2. Welche tatsächliche Arbeitsmenge haben Sie in der ersten Periode des Experiments gewählt?
  - 2.3. Angenommen Sie wählen in der jetzigen Periode eine tatsächliche Arbeitsmenge von 3. Bitte vervollständigen Sie die unten stehende Informationstabelle, die demjenigen Arbeitgeber gezeigt wird, der Ihnen in der nächsten Periode des Experiments per Zufallsentscheid zugeordnet wird. *[Screen with an empty table to be filled shown here.]*
3. Angenommen Sie haben in der letzten Periode eine tatsächliche Arbeitsmenge von 8, in der vorletzten Periode von 10 und in der drittletzten Periode von 3 gewählt. Ihr Arbeitgeber hat Ihnen einen Vertrag ohne Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge angeboten. Der angebotene Lohn beträgt 25, die gewünschte Arbeitsmenge beträgt 10. Sie nehmen den Vertrag an.
  - 3.1. Sie wählen eine tatsächliche Arbeitsmenge von 10. Wie hoch ist Ihr Einkommen? Wie hoch ist der Gewinn Ihres Arbeitgebers?
  - 3.2. Sie wählen eine tatsächliche Arbeitsmenge von 5. Wie hoch ist Ihr Einkommen? Wie hoch ist der Gewinn Ihres Arbeitgebers?

3.3. Sie wählen eine tatsächliche Arbeitsmenge von 1. Wie hoch ist Ihr Einkommen? Wie hoch ist der Gewinn Ihres Arbeitgebers?

4. Angenommen Sie haben in der letzten Periode eine tatsächliche Arbeitsmenge von 8, in der vorletzten Periode von 10 und in der drittletzten Periode von 3 gewählt. Ihr Arbeitgeber hat Ihnen einen Vertrag mit Einschränkung Ihrer Wahlmöglichkeit bei der Arbeitsmenge angeboten. Der angebotene Lohn beträgt 25, die gewünschte Arbeitsmenge beträgt 10. Sie nehmen den Vertrag an.

4.1. Sie wählen eine tatsächliche Arbeitsmenge von 10. Wie hoch ist Ihr Einkommen? Wie hoch ist der Gewinn Ihres Arbeitgebers?

4.2. Sie wählen eine tatsächliche Arbeitsmenge von 5. Wie hoch ist Ihr Einkommen? Wie hoch ist der Gewinn Ihres Arbeitgebers?

4.3. Sie wählen eine tatsächliche Arbeitsmenge von 3. Wie hoch ist Ihr Einkommen? Wie hoch ist der Gewinn Ihres Arbeitgebers?

5. Angenommen Sie befinden sich in der 5. Periode des Experimentes und haben einen Vertrag ohne Einschränkung der Wahlmöglichkeit akzeptiert. In der dritten Periode haben Sie eine Arbeitsmenge von 8, in der vierten Periode eine Arbeitsmenge von 7 gewählt. Welche Informationen erhält dann Ihr nächster Arbeitgeber, wenn Sie in der laufenden Periode eine Arbeitsmenge von 1 wählen? Bitte tragen Sie Ihre Antwort in die untenstehende Informationstabelle für den Arbeitgeber ein. [Screen with an empty table to be filled shown here.]

Wenn Sie alle Aufgaben gelöst haben, strecken Sie bitte auf. Wir kommen dann zu Ihnen und überprüfen Ihre Antworten. Wenn wir Ihre Antworten kontrolliert haben, dann ist es sinnvoll, wenn Sie über Ihre Entscheidungen im Experiment schon einmal gründlich nachdenken.

*[If a subject made a mistake, we explained the relevant part of the instructions again and asked the subject to try the question again. The experiment started only after all subjects had answered all questions correctly.]*

*[End of instructions for the employees.]*

In the following we provide the part of the original German instructions explaining the matching protocol in the competition treatment.

*[Begin of the section explaining the matching procedure in the competition treatment.]*

### **Die Zuordnung von Arbeitgebern und Arbeitnehmern in einer Periode**

In jeder Periode werden jeweils vier Arbeitgeber und vier Arbeitnehmer einander zugeordnet (siehe Abbildung 1). Die Gruppen werden im Zufallsverfahren durch den Computer in jeder Periode neu zusammengestellt. Sie befinden sich somit in jeder Periode in einer neuen Gruppe mit neuen Arbeitnehmern und neuen anderen Arbeitgebern.

*[Diagram 1 shown here.]*

Jeder Arbeitgeber erfährt zu Beginn einer Periode die durchschnittliche Arbeitsmenge in den letzten drei Perioden jedes einzelnen der vier Arbeitnehmer in seiner Gruppe. Dann bestimmt jeder Arbeitgeber für jeden der vier Arbeitnehmer ein Vertragsangebot. Schliesslich muss jeder Arbeitgeber die Reihenfolge festlegen, in der seine Angebote den vier Arbeitnehmern vorgelegt werden sollen. Die Zuordnung von Arbeitgebern und Arbeitnehmern erfolgt in Runden (siehe Abbildung 2). Jeder Arbeitgeber legt fest, welchem Arbeitnehmer sein Vertragsangebot in Runde 1 gemacht werden soll, welchem in Runde 2, welchem in Runde 3 und welchem in Runde 4.

*[Diagram 2 shown here.]*

Ein einzelner Arbeitgeber kann einem bestimmten Arbeitnehmer nur ein Angebot machen. Es ist nicht möglich, dass ein Arbeitgeber beispielsweise dem Arbeitnehmer 3 sowohl in Runde 1 wie auch in Runde 2 ein Angebot macht. Ebenso kann ein einzelner Arbeitgeber pro Runde nur ein Angebot machen. Es ist nicht möglich, dass ein Arbeitgeber beispielsweise sowohl dem Arbeitnehmer 2 wie auch dem Arbeitnehmer 4 ein Angebot in Runde 1 unterbreitet. Ein Arbeitgeber macht also jedem der vier Arbeitnehmer in genau einer Runde ein Angebot. Ein Arbeitnehmer kann jedoch in einer Runde mehrere Angebote (von verschiedenen Arbeitgebern) bekommen. Es kann auch vorkommen, dass ein Arbeitnehmer in einer Runde kein Angebot bekommt.

Obwohl jeder Arbeitgeber insgesamt vier Arbeitsverträge anbietet, kann höchstens einer dieser Verträge angenommen werden. Sobald in einer Runde ein Angebot eines Arbeitgebers angenommen wurde, verlieren automatisch die Angebote dieses Arbeitgebers, die in den

folgenden Runden gemacht werden sollten, ihre Gültigkeit und werden den jeweiligen Arbeitnehmern nicht mehr angezeigt.

Ebenso kann ein Arbeitnehmer höchstens ein Vertragsangebot annehmen. (Jeder Arbeitnehmer bekommt mindestens ein Angebot, kann aber bis zu vier Angebote im Laufe der vier Runden bekommen.) Wenn ein Arbeitnehmer in einer Runde ein Vertragsangebot angenommen hat, so bekommt er in den darauffolgenden Runden keine weiteren Angebote mehr. Alle Verträge, die dem Arbeitnehmer in den folgenden Runden von anderen Arbeitgebern angeboten worden wären, verlieren automatisch ihre Gültigkeit und werden nicht mehr angezeigt. Auch wenn ein Arbeitnehmer in einer Runde mehrere Vertragsangebote (von verschiedenen Arbeitgebern) bekommt, kann er höchstens eines dieser Angebote annehmen.

Es ist also nicht möglich, dass ein Arbeitgeber Verträge mit mehreren Arbeitnehmern abschliesst oder dass ein Arbeitnehmer Verträge von mehreren Arbeitgebern annimmt. Pro Periode kann jeder Teilnehmer maximal eine Vertragsbeziehung eingehen. Es kann jedoch vorkommen, dass ein Arbeitgeber oder ein Arbeitnehmer gar keinen Vertrag abschliessen. Bei einem Arbeitnehmer ist das der Fall, wenn er alle seine Vertragsangebote ablehnt. Bei einem Arbeitgeber ist das der Fall, wenn alle Arbeitnehmer seine Vertragsangebote ablehnen oder schon Vertragsangebote anderer Arbeitgeber angenommen haben. Nach Ablauf von Runde 4 wählen diejenigen Arbeitnehmer, die einen Vertrag angenommen haben, ihre tatsächliche Arbeitsmenge. Dann werden alle Arbeitgeber und Arbeitnehmer über ihren Gewinn bzw. ihr Einkommen in der gegebenen Periode informiert. Danach beginnt die nächste Periode.

*[End of the section.]*